



88015512

PB85-128296

Evaluation of the Forage Value Index

(U.S.) Bureau of Land Management, Washington, D.C.

Prepared for

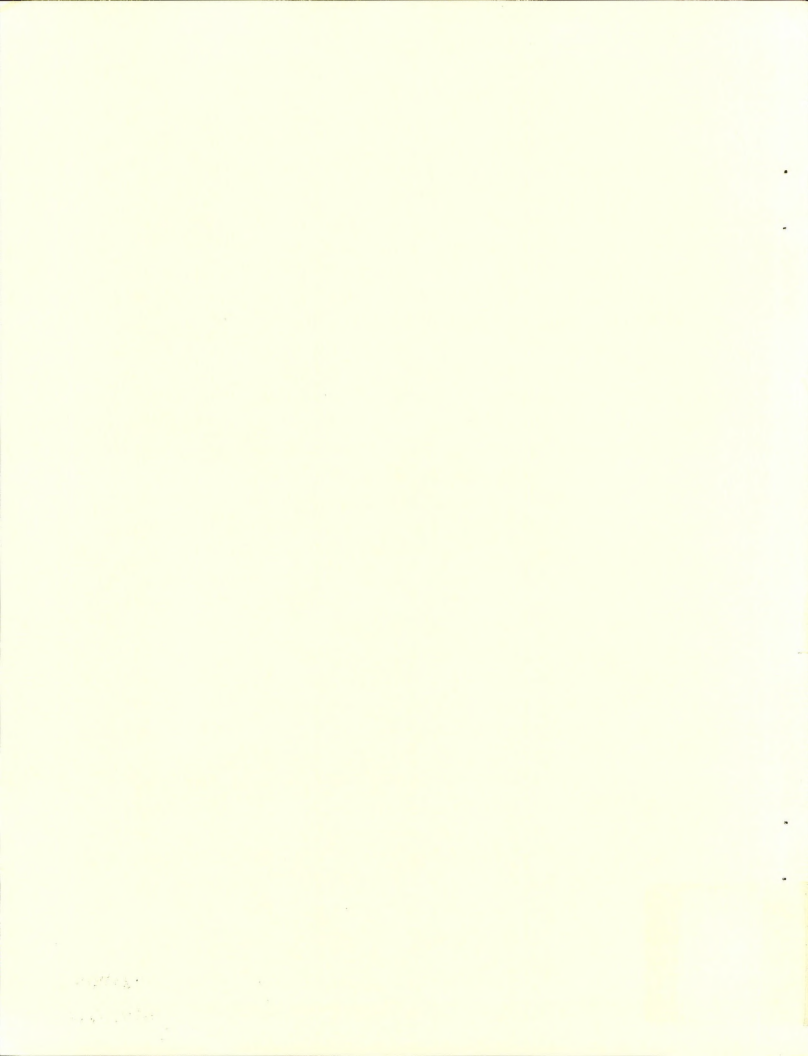
Forest Service, Washington, D.C.

31 Jul 84

HD
241
.N44
1984
c.2

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

NTIS



#13105146

ID: 88015512

PB85-128296

HD
241
.N44
1984
C.2

EVALUATION OF THE FORAGE VALUE INDEX

BUREAU OF LAND MANAGEMENT LIBRARY

Denver, Colorado

by



88015512

Judy Ellen Nelson
Rangeland Economist
Division of Rangeland Resources
Washington Office
Bureau of Land Management

and

Michael Garratt
Senior Statistician
Scientific Systems
Denver Service Center
Bureau of Land Management

FINAL REPORT

for

United States Department of Agriculture
Forest Service

and

United States Department of the Interior
Bureau of Land Management

July 31, 1984

This is a special report for the Grazing Fee Review and Evaluation
mandated by the Public Rangelands Improvement Act of 1978.

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

REPORT DOCUMENTATION PAGE		1. REPORT NO.	2.	3. Recipient's Accession No.
4. Title and Subtitle Evaluation of the Forage Value Index		5. Report Date July 31, 1984		
7. Author(s) Judy E. Nelson and Michael Garratt		6.		
9. Performing Organization Name and Address U.S. Department of the Interior Bureau of Land Management 18th and C Streets, NW. Washington, D.C. 20240		8. Performing Organization Rept. No.		
12. Sponsoring Organization Name and Address USDA-Forest Service, Range Management, Room 601 RPE P.O. Box 2417 12th and Independence SW Washington, DC 20013		10. Project/Task/Work Unit No.		
		11. Contract(C) or Grant(G) No. (C) (G)		
		13. Type of Report & Period Covered 6/77-6/81		
15. Supplementary Notes Special report for the USDA Forest Service and USDI Bureau of Land Management Grazing Fee Review and Evaluation in accordance with the Public Rangeland Improvement Act of 1978.		14.		
16. Abstract (Limit: 200 words) Public land grazing fees are annually derived from a fee formula which annually adjusts private grazing land lease rates by the annual rate of change from the base year. The annual Forage Value Index (FVI) derived from private lease rates. The objective of the study was to examine the FVI, and address issues of whether to retain, amend, or replace the FVI. The analysis identifies the lack of knowledge about the public grazing lands, their comparability with leased private rangeland, and that the FVI, in the short-run is an effective measure of the rate of change.				
17. Document Analysis a. Descriptors Grazing Fees, Private Grazing Land Lease Rates Forage Value Index June Enumerative Survey (JES), Northern Great Plains Study.				
b. Identifiers/Open-Ended Terms				
c. COSATI Field/Group				
18. Availability Statement: No restriction on distribution available from National Technical Information Service		19. Security Class (This Report) Unclassified		21. No. of Pages
		20. Security Class (This Page) Unclassified		22. Price

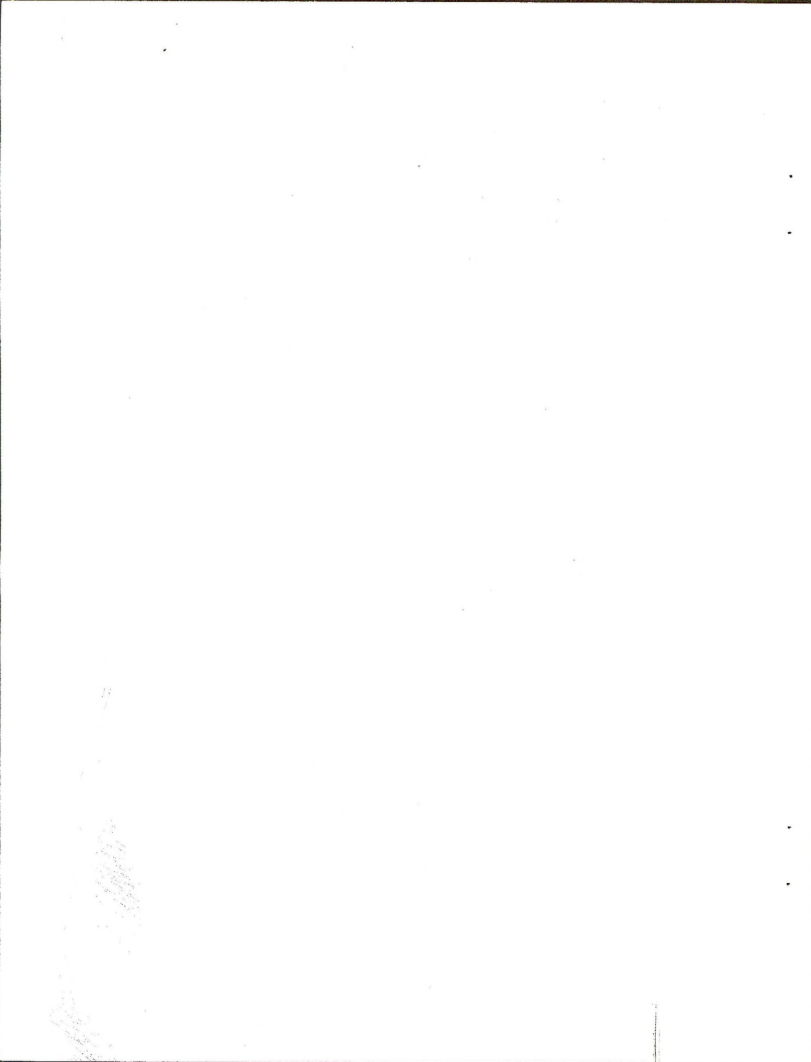
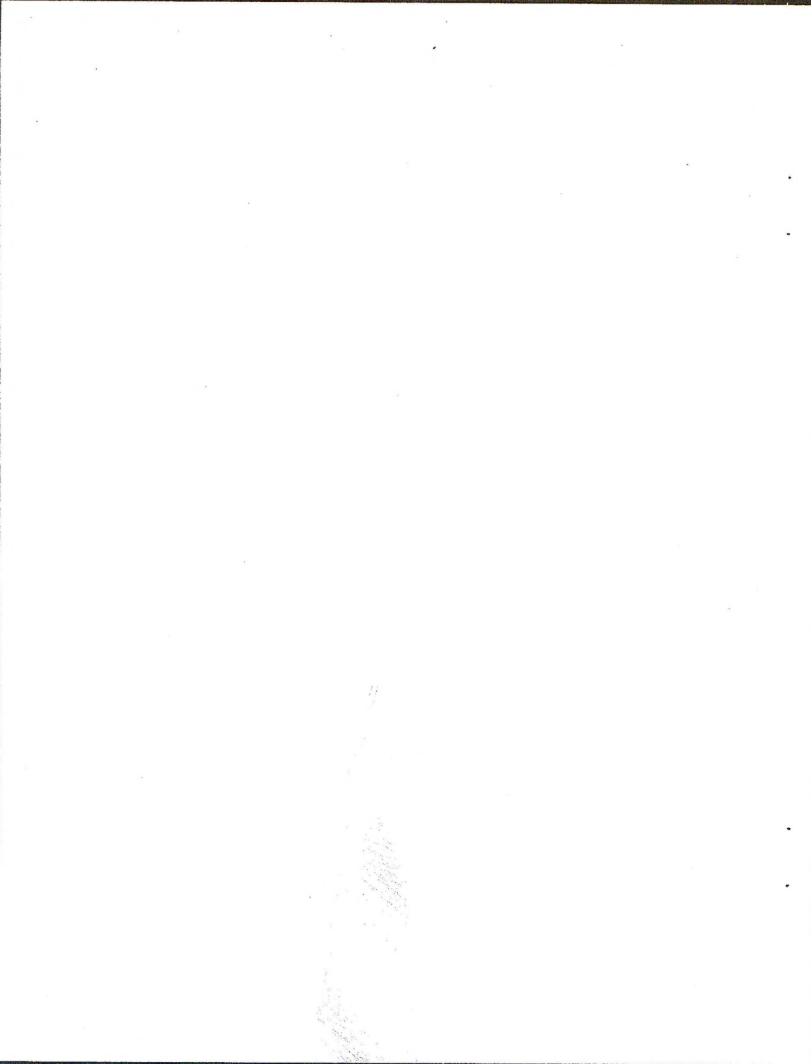


TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	1
II. HISTORY OF THE FORAGE VALUE INDEX	4
A. 1966 Fair Market Value Formula	4
B. Range Forage Index or Forage Value Index	7
C. 1976 Technical Committee's Review of the Forage Value Index	9
D. Comparative Analysis of the June Enumerative Surveys, the December Enumerative Surveys, and the Multiple Frame Survey for 1977 and 1978	12
E. 1978 Special Wyoming Survey	18
III. NORTHERN GREAT PLAINS STUDY	22
A. Purpose of the Study	22
B. Statistical Analysis of the Northern Great Plains Study Data	26
1. The Multiple Frame Survey	26
2. The 51-County Study	32
C. Comparison of the Northern Great Plains Study, the Multiple Frame Survey, and the 1981 June Enumerative Survey	37
D. Conclusions from the Northern Great Plains Study	40
IV. JUNE ENUMERATIVE SURVEYS FOR 1982 AND 1983	43
V. A COMPARISON OF THE FAIR MARKET VALUE APPRAISAL AND THE JUNE ENUMERATIVE SURVEY	50
VI. PRIVATE GRAZING LAND LEASE RATES DATA PROBLEMS AND RECOMMENDATION	64
VII. CONCLUSIONS	71
VIII. END NOTES	72



IX. APPENDICES

A. Derivation of the Forage Value Index	A-1
B. June Enumerative Survey	B-1
C. A Statistical Analysis of the Northern Great Plains Study	C-1
D. Questionnaires	D-1
1. March 1975 Farm Report Questionnaire	D-1
2. 1977 December Livestock Survey Questionnaire	D-4
3. 1978 Wyoming Grazing Fee Survey Questionnaire	D-6
4. 1981 Five-State Grazing Fee Survey Questionnaire (NGP Study)	D-10
5. 1982 June Enumerative Survey Questionnaire	D-14

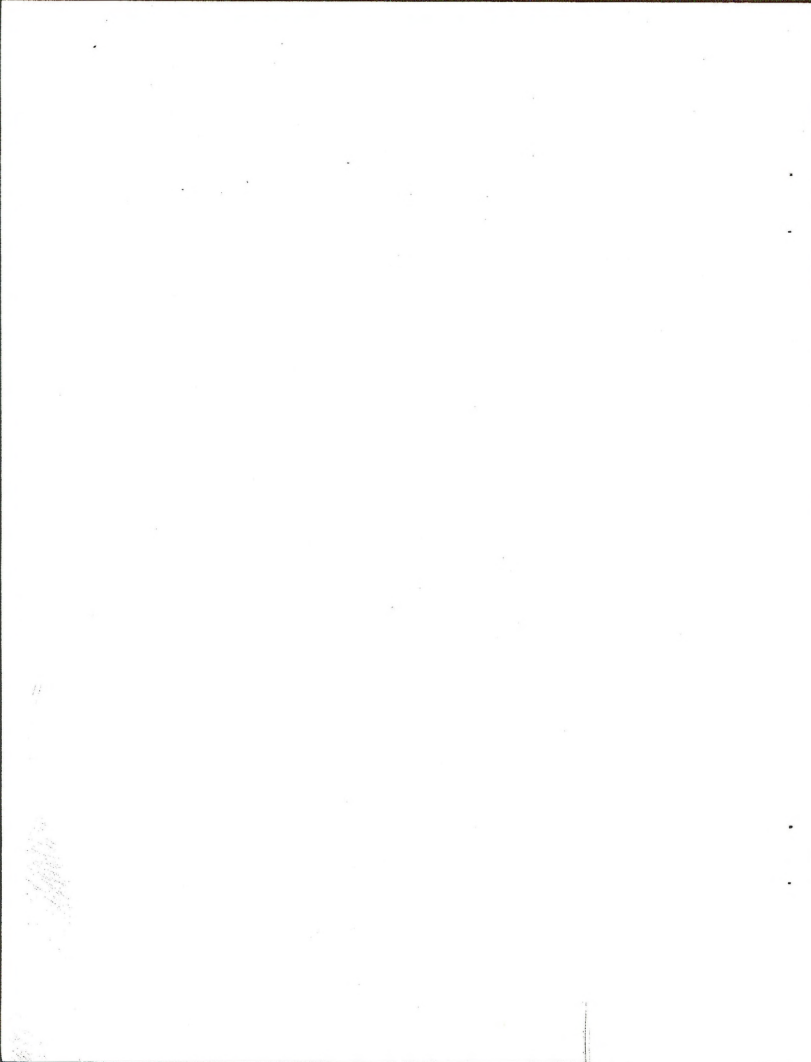
FIGURES

I. Comparison of Responses to the June Enumerative Survey (JES) for 1977	14
II. Northern Great Plains Study Area	24
III. Multiple Frame Study Descriptive Statistics, Percent Positive Responses by State	29
IV. 51-County Study Descriptive Statistics, Percent Positive Responses by State	35
V. 1982 and 1983 Average June Enumerative Survey Values	44
VI. Reported Grazing Land Lease Rates, June Enumerative Survey for 1979 to 1983	48
VII. 1983 Fair Market Appraisal Mean Values and 1983 June Enumerative Survey Values	55
VIII. Appraisal Grazing Land Lease Rates and June Enumerative Survey for 1979 to 1983	60
IX. Public Land AUM's and Weights Used in the 1982 June Enumerative Survey, 11 Western States	68
X. Public Land AUM's and Weights Used in the 1982 June Enumerative Survey, 16 Western States	69

TABLES

	PAGE
I. Comparison of Responses to the June Enumerative Survey and the Multiple Frame Survey for 1977	13
II. Results of 1977 December Enumerative Survey	16
III. Results of 1978 June and December Enumerative Surveys	19
IV. Special Survey of Wyoming Grazing Arrangements in 1978	20
V. Multiple Frame Survey Descriptive Statistics: Unweighted Means of Study Variables by State	27
VI. Multiple Frame Survey Descriptive Statistics: Percent Positive Responses and Unweighted Mean Fee Paid by State	28
VII. Multiple Frame Survey Correlation Analysis: Correlation Coefficient with Fee/AUM	31
VIII. 51-County Study Descriptive Statistics: Means of Study Variables Not Adjusted for Nonrespondents	33
IX. 51-County Study Descriptive Statistics: Percent Positive Responses and Mean Fee Paid by State Not Adjusted for Nonrespondents	34
X. Comparative Analysis of Private Grazing Land Lease Rate Data Obtained Through the Northern Great Plains Study (51-County Study and Multiple Frame Survey) and the 1981 June Enumerative Survey	38
XI. Grazing Lease Rates and Number of Reports by Respondent Category, 1982 JES	45
XII. Grazing Lease Rates and Number of Reports by Respondent Category, 1983 JES	46
XIII. Private Grazing Land Lease Rates	49
XIV. Description of the Appraisal Data Base	51
XV. Correlation of the Appraisal Variables with the JES State-by State Analysis	53
XVI. Correlation of the Appraisal Variables with the Change in the JES Values on a State-by-State Basis	56
XVII. Correlation of the Appraisal Variables with the JES Westwide Analysis	57

XVIII.	Correlation of the Appraisal Variables with the Change in the JES Values on a Westwide Basis	56
IXX.	A Comparison of the Correlations Between Persons Responding to the June Enumerative Survey Who Leased Grazing Lands and Who Did Not Lease Grazing Lands and the Grazing Rental Appraisal	63



I. INTRODUCTION

Fees for grazing livestock on the public lands are determined annually according to a fee formula established by Congress in the Public Rangelands Improvement Act (PRIA) of 1978. That formula contains three indices of economic conditions, which are used to adjust the "fair market value" (FMV) of grazing upward or downward to reflect the actual "economic value" of the land to the ranchers each year. One of these indices is the Forage Value Index (FVI), which is derived from private grazing land lease rates. This paper examines possible problems with the FVI that stem from data used to determine annually the rates for leasing private grazing lands in the Western States.

When Congress established the PRIA fee formula, it did so on a 7-year trial basis (1979-1985). At the end of this trial period, the Secretaries of the Departments of the Interior and Agriculture are to report to Congress on their evaluations of the PRIA formula and alternative fee formulas, and their recommendations for a fee schedule for 1986 and subsequent grazing years. The information described in this paper will be used by a technical committee as background information on which to base the Bureau of Land Management (BLM) and the Forest Service's recommendations to the Secretaries on whether to retain, amend, or replace the PRIA grazing fee formula. Any of these options must also address the issue of whether to retain, amend, or replace the FVI and other indices now used to measure factors affecting grazing land lease values.

The FVI is the most controversial of the three indices used in the grazing fee formula, and it has been the subject of several previous studies. This paper traces the history of the index, beginning with a description of the 1966 Western Livestock Survey and the FMV formula. The perceived inadequacies of the FMV formula value to measure FMV resulted in the eventual adoption of the PRIA formula and the use of the other indices to modify the FVI. The history continues with discussions of other special studies of the FVI that were conducted as a result of a 1976 Technical Committee Report.

This background information is followed by an analysis of the most recent studies of the FVI. In response to the concerns being voiced by ranchers using National Grasslands about the values used to construct the FVI, and because of the fee formula study required by the PRIA, a special study of the FVI was conducted in a five-State area in the Northern Great Plains (NGP) in 1980. The results of the NGP Study are summarized in the body of this paper; the complete report on a statistical analysis of the data is included in the Appendices.

Inconsistencies between the lease rates obtained through the NGP Study and the June Enumerative Survey (JES), which is the method used annually to determine the private grazing land lease rates, resulted in the agencies initiating a second study. In 1982 and 1983, the JES was expanded to include questions that would determine if the sampling methodology used introduced a bias into the data obtained. This paper presents the results of an analysis of this study.

In 1982, the BLM and the Forest Service also initiated a study of the fair market rental value of public grazing lands. Information on over 47,000 grazing lease arrangements was gathered and summarized for analysis. More than 10,000 of these lease arrangements are private negotiated leases with the price based on FMV. This paper discusses the results of a comparison of the values obtained through the appraisal with the values obtained through the survey approach used in the JES.

Several problems with the FVI have been identified during the course of these studies. These problems include uncertainty about the variable being measured and the most reasonable approach to gathering the needed data. The final section of this paper addresses these and other questions that must be resolved prior to any decision concerning the continued use of the FVI in a grazing fee formula.

II. HISTORY OF THE FORAGE VALUE INDEX

1966 Fair Market Value Formula

Before passage of the PRIA in 1978, fees for grazing domestic animals on public rangelands administered by the BLM and the Forest Service in the Western United States were determined by the "fair market value" formula. The FMV formula was based on a model developed at Utah State University.¹

"An economic model developed at Utah State University is based on the assumption that the economic principles of supply and demand operate in a competitive range forage price market just as they do for products in other markets. The economic rationale of the study was the alternative cost concept. The essence of this principle is the value of public range forage used for grazing is equal to the rental value of private pastures leased for grazing after adjusting for differences in the costs of services provided on the private lands but not on public grazing lands.

The BLM and Forest Service strive to develop the range resources to their reasonably attainable productive potential and manage them for sustained grazing in association with interrelated uses. This objective binds the public grazing permittee by a number of requirements and restrictions that impose additional non-fee operating cost on the permittee which usually are not imposed on the lessee of private lands. The amount of non-fee costs borne by the permittee and private lessee will have a direct bearing on how much he can pay as fees or rent.

In other words, if a competitive market exists for grazing forage, total user costs for comparable public land and private ranges will be equal. If use cost differentials exist, ranchers in a competitive market will attempt to gain control of the low-cost forage source. The non-fee costs plus the private lease rate represent the total cost of operation on leased private land. When the non-fee cost items for public land users are subtracted from the total cost to the rancher leasing comparable private grazing land, the difference measures the dollar value a rancher should be willing to pay in a competitive market for the use of the public land."²

The grazing fee formula resulting from the Utah model can be stated:

$$\text{Fee} = F_p + (TC_p - TC_f)$$

where: Fee = What the rancher should be willing to pay in the Utah model.

F_p = The private lease rate per animal unit month (AUM).

TC_p = Total costs of operating livestock on private leased grazing lands.

TC_f = Total costs of operating livestock on public (Federal) grazing lands.

The variables, F_p , TC_p , and TC_f , were measured through the 1966 Western Livestock Survey. Over 10,000 ranchers and 2,000 financial institutions were interviewed as part of this survey. A large number of questions on cost elements, i.e., distance to lease, type of transportation, hours of labor, etc., were asked to determine the total costs of using private leased and public grazing lands. The resultant fee was to be adjusted annually by the "range forage index" (RFI) to reflect annual changes in the value of the leased grazing forage. The RFI was computed from the average rental rates paid by ranchers for private forage in the 11 Western States, as published annually in "Farm Real Estate Market Developments" by the Economic Research Service (ERS), United States Department of Agriculture. The annual FMV grazing fee formula was:

$$\text{FMV} = \$1.23 \times \text{RFI}$$

where: \$1.23 = The base (fee) value established by the 1966 Western Livestock Survey.

Information on other factors, i.e., season of use, vegetative type, carrying capacity, type of livestock, geographic location, and size of the permit, was also gathered. Regression analyses were performed with the objective of correlating the costs of grazing to these factors, which would allow the establishment of a variable fee. Except for size classes, the analyses did not establish that any apparent differences were due to these factors. In the words of the 1969 Technical Committee:

"Variation among individual allotments of grazing cost per animal unit month (AUM) was very large within every category studied, namely, ranching area, season of use and size of permit or lease. The strongest relationship found was the tendency for grazing cost to decrease as the size of the allotment increased. Other relationships might have existed but could not be firmly established because of large random variation in the data. The wide variation of grazing cost among individual allotments should be interpreted as a reflection of the actual situation and not as an indication of inaccurate data."³

The major cost that was excluded from the computation of the grazing fee formula was the cost of obtaining a public land grazing permit (permit value). The following quote describes the origin of the permit value:

"The remainder of the user-cost-difference has historically been paid as premiums to current permit holders by ranchers attempting to gain control of the public grazing permit.

A cost differential between the use of grazing Federal rangelands and private rangelands did come into existence, because the administratively set grazing fees were not free to reach an equilibrium in the market place. This cost differential gave the public land rancher a net income advantage over the non-public land rancher. The rancher who was allotted a certain number of BLM or Forest Service grazing privileges found himself with income producing capability above that on comparable private leases. The present worth of the anticipated flow of these net income advantage over time was soon capitalized into the sales price for the grazing privileges as the grazing permit was transferred from rancher to rancher."⁴

It is beyond the scope of this paper to discuss the equity issues involved with including or excluding permit value in a grazing fee formula. However, we will address permit value as it relates to the Utah model, which is the basis for the FMV formula.

In its full formulation, the Utah model included permit value as a factor:

$$P_i = (R_p + C_p) - (F_f + C_f)$$

where: P_i = Permit sales price discounted at rate i .
 R_p = Rental rate for private (p) range.
 C_p = Costs associated with private range.
 F_f = Grazing fee for Federal (f) range.
 C_f = Costs associated with Federal range.

In this formulation, the Utah model constitutes a testable hypothesis.

We do not know whether the 1966 Western Livestock Survey would have validated the Utah model because it was never fully investigated. A BLM evaluation of the data in the 1966 survey merely concluded that:

"Regression and correlation analyses of the relationship between grazing cost differentials and permit prices at the District-level failed to show any significant degree of association. These analyses do not prove or disprove that there is a relationship between permit prices and cost differentials because the District data may be 'confounded' by the interaction of variables such as economies of scale associated with permit size, season of use, and type of livestock."⁵

Range Forage Index or Forage Value Index

The 1966 Western Livestock Survey questionnaire asked for considerable information on the number of livestock by class, season of use, etc., which allowed the computation of a dollars per AUM charge. The actual question asked on lease rates was "What was the total dollars paid for

this lease for the past full grazing season?" The questionnaire then went on to identify any landlord services included in the lease rate. If landlord services existed, information on these costs were to be excluded from answers to the remaining questions.

Any discussion of an appropriate data set that might have been used to update the 1966 base value seems to have been obscured by the "hotter" issues of permit value and the phase-in of the FMV formula. The primary concern about the data to be used to update the base seems to have been the desire to use a readily available, published source of private grazing land lease rates. Hence, the RFI was derived from the rates, by State, that were published in the "Farm Real Estate Market Developments." These rates, in turn, were derived from information collected in response to a question on private lease rates in the March Farm Report Questionnaire, a questionnaire sent to a nonprobability, general purpose list of grain farmers, dairy farmers, fruit farmers, etc. The questionnaire was mailed annually to 12,500 farm operators, with an average of approximately 1,000 recipients responding to the question on the grazing rental rates.⁶

Appendix A is a copy of the March Farm Report Questionnaire. The relevant question asked was (emphasis in original):⁷

"Report average cash rents expected in your locality during the 1975 season;

ALL NONIRRIGATED GRAZING OR PASTURE LANDS

Average rent per acre for pasture or grazing lands	\$ _____
Value per acre of this pasture or grazing land	\$ _____
Average rate for pasturing cattle on PRIVATELY OWNED LAND this year	\$ _____
per head per month	\$ _____ "

In contrast to the 1966 Western Livestock Survey, which derived a dollars per AUM pricing unit from other information, the March Farm Report Questionnaire defined the pricing unit as a charge per head per month. The RFI was derived by weighting the State values by the weights determined through the 1966 Western Livestock Survey and dividing by \$3.65, the average weighted value for private lease rates for 1964-1968.

1976 Technical Committee's Review of the Forage Value Index

By 1976, enough criticism had been directed toward the RFI, which had been renamed the FVI, to warrant a special review. As stated in retrospect in the 1977 Grazing Fee Report:

"The permittees have not been satisfied with the private grazing land lease rate index, arguing that the data represent nonlivestock uses, that typical leases in the private sector are not negotiated on a head per month basis, and that those responding to the survey question are not making proper transition from the actual existing lease to the head per month lease basis."⁸

Partly because of the concern over the data used to construct the index of private grazing lease rates, the Federal Land Policy and Management Act of 1976 required a review of the FMV grazing fee formula. The primary objective of the Technical Committee formed to conduct this review was to identify existing data sources and/or refinements to existing data sources, and/or additional data that might be collected to enhance the present or alternative procedures for determining grazing fees.

During its review, the Technical Committee raised several additional concerns about the validity of the index data used. The Committee questioned the validity of a nonprobability survey, comparability between public and private grazing lands, and the use of a "reporter" question.⁹ The reporter question asked respondents to "report average cash rents expected in your locality," but did not distinguish between persons estimating or actually paying the reported rates.

The ERS defended the use of the March Farm Report Questionnaire by stating that:

"Because the survey is a voluntary mail survey and is not developed on a probability sampling frame, the data may not reflect the true average value of all private cash leases. However, the ERS believes that year to year changes in the average value shown by the survey accurately reflect the rate of change in private lease rates. For this purpose, the data should be reasonably accurate, since the sample content is quite stable over time; that is, most individuals in the sample for any given year would also have reported in the preceding year, so that the measure of change from the preceding year would be relatively accurate. This assumes that reporters are knowledgeable about grazing fees; experience would indicate that those reporting these fees do have knowledge of the prevailing rates in their localities.

Annual data collected in a similar manner for farm real estate values have tracked within 3 percent of the value reported by the Census of Agriculture over a 5 year time span.

It should be noted that any attempt to strengthen significantly the reliability of the data would be quite costly in that it would require the selection of a special probability sample and the use of enumerators to collect the data."¹⁰

The ERS's defense of the survey technique behind the March Farm Report Questionnaire was never fully accepted. To correct the problem of a nonprobability sample, the Technical Committee recommended that either the

Statistical Reporting Service's (SRS) JES or the Cattle Multiple Frame (MF) Survey, administered in January, be used in place of the March Farm Report Questionnaire to collect the data on the private grazing rental rates.¹¹ Both of these survey instruments are based on a probability sample. The MF Survey draws a sample of cattle operators, whereas the JES draws a sample of land areas.

The JES was chosen to derive the FVI used in the grazing fee formula. (A more complete explanation of the sampling methodology contained in the JES is provided in Appendix B.) Questions recommended by the Technical Committee for inclusion in the JES follow:¹²

"All Nonirrigated Grazing or Pasture Lands

1. Average rate for pasturing cattle on PRIVATELY OWNED LAND in this area this year per head per month basis _____
2. Do you personally rent privately owned nonirrigated pasture on
 - a) a per head per month basis? _____
 - b) a per acre basis? _____
3. If yes, how many head of cattle are you pasturing this year on the privately owned nonirrigated pasture? _____
4. How many days will you have cattle on rented pasture? _____
5. Total rent paid for pasturing these cattle on privately owned pasture this year? _____ "

The Technical Committee's questions were added to the 1977 JES. However, a major flaw with the Technical Committee's recommendation was that the Committee never stated the purpose of the additional questions or how the results should be used. As a result, as early as the 1977 JES, the SRS stated:

"These data do not serve all the purposes intended. These data were expected to establish if the locality question (i.e., what is the charge in your area?) was biased by respondents without experience in renting land for grazing.

The data have sufficient unexplained variations to make it inadequate for determination of grazing charges or as measurement of respondent bias."¹³

Comparative Analysis of the June Enumerative Surveys, the December
Enumerative Surveys, and the Multiple Frame Surveys for 1977 and 1978

Information from the 1977 JES, which contained the questions recommended by the Technical Committee, was compared with information collected through a MF Survey, conducted in July, and a December Enumerative Survey (DES).

The 1977 JES asked 6,930 operators with cattle the question on grazing fee charges per head per month in their area. Twenty-six percent, or 1,777 of the operators responded to the question; 315 operators, or 18 percent of those answering the question, actually leased grazing lands. Actual rents paid were considerably lower than the average rate reported for the locality (Section A., Table I and Figure I). One possible explanation for this discrepancy is that the data base for actual rents paid would have included rates for older, less expensive leases, while the average rate reported would have been based on newer, more expensive leases.

TABLE I

Comparison of Responses to the June Enumerative Survey
and the Multiple Frame Survey for 1977

Section A.

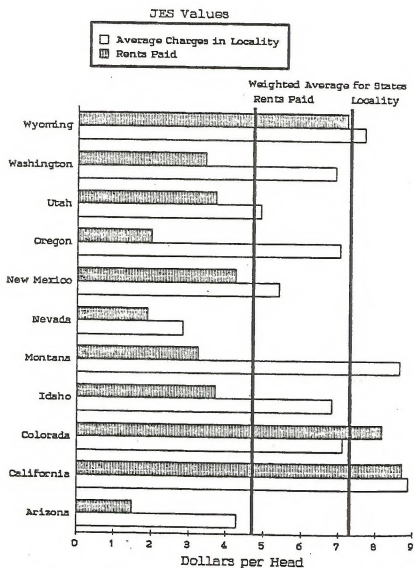
State	June Enumerative Survey		Rents Paid	
	Average Charges in Locality			
	# Responding	\$/Head	# Responding	\$/Head
Arizona	36	4.28	4	1.48
California	332	8.88	40	8.72
Colorado	267	7.10	45	8.16
Idaho	111	6.80	28	3.70
Montana	119	8.64	45	3.24
Nevada	12	2.83	8	1.88
New Mexico	122	5.38	36	4.23
Oregon	277	7.02	40	1.97
Utah	74	4.90	14	3.71
Washington	236	6.89	39	3.42
Wyoming	<u>111</u>	<u>7.67</u>	<u>16</u>	<u>7.20</u>
Total	1,777			
Average		7.29	315	4.69

Section B.

Multiple Frame Survey Compared with June Enumerative Survey

State	Multiple Frame Survey		JES
	# Responding	\$/Head	\$/Head
California	428	8.61	8.88
Colorado	498	6.98	7.10
Idaho	233	6.74	6.80
Montana	692	8.55	8.64
New Mexico	319	5.67	5.38
Wyoming	<u>482</u>	<u>7.98</u>	<u>7.67</u>
Total	2,652		
Average		7.61	7.67

Figure I
Comparison of Responses to the
June Enumerative Survey (JES) for 1977



The 1977 MF Survey asked the locality question to a much larger sample population in the 28 States covered by this survey, but only 6 of the 11 Western States were covered. Results similar to the 1977 JES were obtained in the MF Survey, which would indicate that the smaller sample used in the JES adequately represented the larger population (Section B., Table I).

The 1977 DES included additional questions on rents received, rents paid, and the average rent in an area. The question on average charges in the area was expanded to include rates per AUM, per cow with nursing calf, and per yearling. Questions included:¹⁴

"Did you rent out?"	_____ AUM
	_____ Acre
Average charge in area?	_____ AUM
	_____ Cow with nursing calf
	_____ Yearling
Did you pay rent?	_____ AUM
	_____ or information on class of animal and season of use to allow the computation of AUM"

Table II shows the results of the 1977 DES. Because of the small sample size, conclusive results were not obtained. Responses to rents paid, however, are fairly close in amount to the responses to average rents received in the area, which contradicts the results of the 1977 JES.

TABLE II

Results of 1977 December Enumerative Survey

Weighted Average Charges per AUM by Respondent Category

State	Rents Received Rate Basis		Rents Paid Rate Basis		Average Charges in Locality		
	AUM	Non-AUM	AUM	Non-AUM	AUM	Cow/Calf	Yearling
				\$			
Arizona	5.83	-	4.17	-	3.69	4.20	2.67
California	7.07	5.17	7.23	7.36	7.63	7.62	5.62
Colorado	-	-	7.71	2.20	7.22	8.50	5.70
Idaho	7.14	-	6.23	.76	7.26	7.60	6.73
Montana	6.52	3.49	8.30	.89	7.22	9.04	6.14
Nevada	-	-	-	-	1.44	1.33	.87
New Mexico	2.03	-	8.78	2.54	8.02	7.03	5.82
Oregon	7.01	6.34	6.59	4.63	5.32	7.12	6.15
Utah	-	-	8.00	5.69	6.08	6.15	3.32
Washington	5.36	-	6.80	6.62	7.12	8.84	7.55
Wyoming	9.38	1.61	7.75	4.49	8.69	9.75	7.67
Average	5.55	4.26	7.43	3.40	7.11	8.18	6.19

Number Responding by Respondent Category

State	Surveyed Population	Rents Received Rate Basis		Rents Paid Rate Basis		Charges in Locality
		AUM	Non-AUM	AUM	Non-AUM	Any Question
Arizona	7	2	0	2	0	6
California	24	2	2	5	1	20
Colorado	50	0	0	7	9	43
Idaho	14	2	0	4	1	12
Montana	36	3	2	8	2	29
Nevada	4	0	0	0	0	4
New Mexico	41	3	0	5	6	36
Oregon	30	1	2	7	8	18
Utah	18	0	0	1	4	13
Washington	27	5	0	6	3	22
Wyoming	26	3	2	6	3	21
Total	277	21	8	51	37	224

As can be seen, emphasis was placed on a per AUM response while a per head per month charge was not even a response category. The interviewer's manual states:

"In the Western States, the term "AUM" is widely understood. An AUM (animal unit month) is the amount of forage used by a 1,000 pound cow in one month. The following table shows the equivalent animal unit for several kinds of cattle:

Animal Unit	
Cow	1.0
Cow with nursing calf	1.2
Yearling	.7
Calf under 500 pounds	.3
Bull	1.3

The respondent does not have to be using grazing land to answer, but simply know the 'typical' or prevailing charge.

Charges can vary substantially from area to area depending on the division of responsibilities over who will maintain the fences, water facilities, put out salt and observe the cattle, etc. Charges can also vary depending on other variables such as types of pasture, renting from relatives and other factors. For this survey both 'high' and 'low' fees are to be included.

Item 1 asks the average charges per AUM (1 cow), per cow with nursing calf or per head per month depending on your State's version of the questionnaire. Many times, there is no charge for a nursing calf so ranchers will report these units "as a rate per AUM. When an AUM rate is reported, but it consists of a cow with nursing calf, the rate must be recorded in code box 917 [cow with nursing calf].

The respondent need not answer one classification. Do not probe for answers to this question because no entry is necessary."¹⁵

This language remains in the interviewer's manual today, although it is not clear that the term AUM is widely understood or what pricing unit actually should be measured. It is interesting to note that in the 1977 DES, the AUM charge basis is the most common charge basis among the 11 Western States (Table II). The AUM charge, however, is not the most common basis in each of the individual States surveyed.

The 1978 JES only asked locality charges and restricted the choices to AUM's and cows with nursing calves (Section A, Table III). The 1978 DES collected information only from operators that leased lands and asked for rates on an AUM, acre, or rate of gain basis (Section B, Table III). Only one operator reported rates paid on rate of gain basis, so the rate of gain is not included in Table III. The rates reported in the DES are actual charges and are not directly comparable to the rates obtained through the JES, in which rates may be estimates. The actual charges reported in the DES were lower than the average charges reported in the JES. Charges for land rented on a per acre basis also tended to be lower than charges for land rented on a per AUM basis.

1978 Special Wyoming Study

A 1978 survey conducted in Wyoming asked for information about existing leasing arrangements. As in the 1978 DES, information on the fee charges was collected on an AUM, acre, or rate of gain basis. In addition, survey questions were designed to obtain detailed information on the number and class of livestock, season of use, and landlord services. Table IV shows the results of this survey.

The majority of the leases in Wyoming were leased on a dollars/acre basis (73 percent), with dollars/AUM being the next most common (26 percent), and dollars/rate of gain being relatively unimportant (2 percent). Where land was leased on an AUM basis, the reported charge was \$7.92, as compared to the calculated AUM charge of \$4.40 for land leased on a per acre basis. The landowner provided services in 63 percent of

TABLE III

Results of 1978 June and December Enumerative Surveys

Section A.

1978 June Enumerative Survey by Respondent Category				
State	# Responses		Average Charges in Locality	
	Rate Basis		Rate Basis	
	AUM	Cow/Calf	AUM	Cow/Calf
Arizona	13	4	3.42	5.35
California	116	31	8.07	9.20
Colorado	78	65	7.26	8.26
Idaho	42	16	6.43	8.36
Montana	75	65	7.79	9.20
Nevada	15	5	4.10	3.45
New Mexico	68	24	5.94	7.44
Oregon	56	26	6.54	7.13
Utah	42	28	5.73	6.89
Washington	84	29	6.67	5.84
Wyoming	35	29	8.09	10.09
Total	624	322		
Average			7.11	8.29

Section B.

1978 December Enumerative Survey by Respondent Category					
State	# Responses		Rents Received		
	Rate Basis		Rate Basis		
	AUM	Per Acre	AUM	Acres	Combined
Arizona	0	1	-	1.17	1.17
California	3	11	4.13	4.75	5.09
Colorado	4	5	6.96	3.44	4.57
Idaho	6	2	6.68	2.77	5.76
Montana	7	2	4.94	.92	3.56
Nevada	0	0	0	0	0
New Mexico	7	3	1.90	1.27	1.46
Oregon	7	3	5.29	4.75	4.91
Utah	2	2	10.31	2.04	7.63
Washington	8	3	5.66	4.81	5.18
Wyoming	3	4	5.22	3.21	3.73
Total	47	36			
Average			5.45	3.74	4.64

TABLE IV

Special Survey of Wyoming Grazing Lease Arrangements in 1978

Description	AUM ¹ Basis	Per Acre Basis	Rate of Gain	Combined Arrangements
Dollars paid per AUM	\$7.92*	(\$4.40)	\$10.33	\$5.39
Dollars paid per acre	(\$2.52)	\$1.64**	\$ 3.34	\$1.93
Number of Leases	50	145	3	198
Number of Leases of 2 or More Years	23	66	1	90
Average # of Years in Leases for 2 or More Years	9.4	9.0	3.0	9.0
Percent of Leases in which Landlord Provided Material and Labor for Maintenance of Fencing and Water Facilities	63	14	100	27
Percent of Leases in which Landlord Provided Material and Labor for Salting, Checking on Water and Regular Observation of Cattle	34	2	100	11
Percent of Leases in which Landlord Provided Labor for Livestock Control and Moving Cattle	25	4	100	10
Percent of Leases in which Landlord Provided Contracts in which the Landowner Provided Supplemental Feed	8	0	0	1
Percent of Each Type of Leases	25	73	2	100

An Animal Unit Month (AUM) was defined as equivalent to 1,000 pound cow in one month. Equivalents for other livestock are: cow with nursing calf, 1.2; yearling, 0.7; calf under 500 pounds, 0.5; bull, 1.3; horses, 1.3; ewes, 0.2.

* The \$7.92 per AUM is equivalent to \$2.52 per acre.

** The \$1.64 per Acre is equivalent to \$4.40 per AUM.

the leases. In general, the landowner provided more services in land leased on an AUM basis than they provided in per acre arrangements. This result points out a problem that will be discussed later--different rate bases may imply different levels of services in the lease, which decreases the reliability of using these estimates in a grazing fee formula. Information also was gathered on the length of the leasing arrangement, with almost half of the arrangements being leased for more than 1 year. The average length of a lease for more than 1 year was 9.0 years.

III. NORTHERN GREAT PLAINS (NGP) STUDY

Purpose of the Study

In 1980, ranchers who grazed livestock on the National Grasslands in North and South Dakota expressed concern about the use of the JES to derive grazing fees for public rangelands in their area.¹⁶ Since the JES data used in the grazing fee index are based on the average State rate, the ranchers thought that grazing rental rates in the eastern portions of the Dakota's and Nebraska (where few public rangelands exist) were inflating the index value used to determine the public grazing fee. The ranchers also were concerned about possible inflation of the rates due to the short-term nature of some leases. Because of a recent and severe drought in the NGP Study areas, additional short-term leases were being offered at rates which generally were higher than rental rates for long-term leases. Additional concerns about the validity of the JES data were the inclusion of rental rates for dairy cows and horses, and an absence of data on the influence of landlord services, which are typically included in some of the private lease arrangements.

The NGP Study was conducted in 1981 to investigate the ranchers concerns, as well as to determine which factors influenced private grazing land lease rates and to what degree. The NGP Study included two components--a Multiple Frame (MF) Survey and a 51-County Study. The MF Survey was a stratified random sample of all the ranchers in the States of Nebraska,

North Dakota and South Dakota. The 51-County Study was a complete enumeration of all cattle operators with more than 100 cattle located within a 51-County area covering portions of five States--Montana, Nebraska, North Dakota, South Dakota, and Wyoming (Figure II).

The NCP Study questionnaire was designed to determine if the operator leased private grazing land. If private land was leased, the fee paid and the basis for payment were determined. Additional questions examined the size of the operation in terms of the number and type of animals, the number of acres, the number of days grazed, and the location of the operation. Other questions explored the characteristics of the lease arrangement, such as landlord services provided and whether the lease was recurring.

A total of 11,638 interviews were obtained, with 458 duplications due to operators within both the counties covered by the 51-County Study and the three-State area covered by the MF Survey. To facilitate statistical analysis of the data, the fee paid for each lease was converted to dollars per AUM, which is the fee arrangement used by Federal agencies to lease grazing lands. Fee arrangements converted to an AUM basis included dollars per acre, per cow/calf pair per month, and per head per month. A cow was considered one animal unit (AU). All other types of cattle were converted to AU's, the number of days grazed converted to months, and the results used to compute AUM's. A complete description of the conversion formula is included in Appendix C.

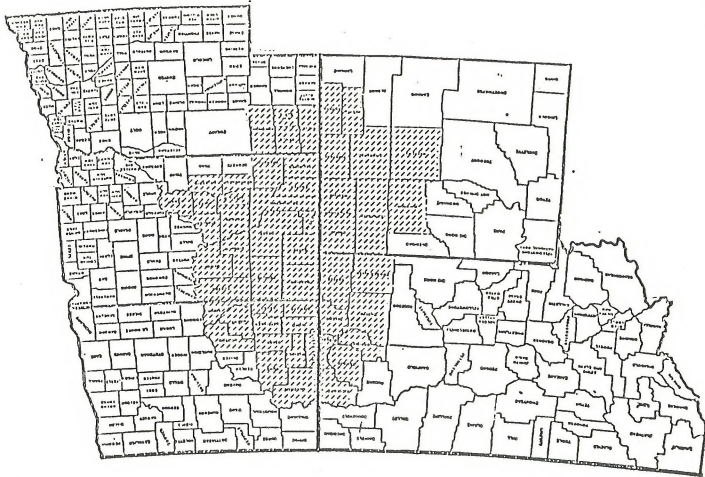


FIGURE 11

Both the SRS and the BLM conducted a statistical analysis of the NGP Study data. The objective of the SRS analysis was to compare the NGP Study data with the 1981 JES and to examine the use of data from an entire State as compared to the use of data from only the target counties. The MF Survey sample was stratified by the total cattle herd size of the ranching operation. The SRS used weights representing the proportion of operators in each strata sampled in computing their estimates. A description of the results of the SRS analysis begins on page 33.

The BLM analysis focused on the factors influencing private land grazing fee rates. The analysis utilized analysis of variance, correlation and regression analysis, and factor analysis. For computational simplicity and consistency, the MF Survey was treated as a simple random sample in the BLM analysis. In the 51-County Study, the SRS similarly included a correction for survey nonrespondents in their estimates while the BLM elected to omit this correction. The differences in the two approaches leads to minor differences in the numerical estimates provided in the two analyses.

The BLM analysis of the factors influencing value is described in the following section. Due to the different nature of the populations sampled in the two components of the NGP Study, the results of each component will be described separately, beginning with the MF Survey.

Statistical Analysis of the Northern Great Plains Study Data

The Multiple Frame Survey: The MF Survey questionnaire was administered to 4,200 ranchers in a three-State area. The following analysis is based on the responses of 860 ranchers among those interviewed who leased private grazing lands.

As illustrated by Table V, significant variations existed among the size and nature of the livestock operations in different States. Ranching operations in the more southern States--Nebraska and South Dakota--were larger than those in North Dakota. More head and AU's were grazed, more acres were grazed, and the total days grazed was longer. The fee paid per AUM was higher in Nebraska and South Dakota than North Dakota. Acres per head were lowest for North Dakota, which was counter to what was expected for the State with the harshest climate of the three.

The vast majority of the leases were recurring in nature, with the majority of lessors providing feed, water, and maintenance of the property (Table VI and Figure III). Few landlords provided doctoring or weed control. The land was used primarily for cattle grazing with few other types of livestock represented. Few lessees rented other public or Federal land. The majority of lease rates were on a per acre basis, while less than 1 percent were based on per AUM. The per acre leases were the cheapest per AUM, presumably because the lessor did not control the number of head the lessee placed on the property.

TABLE V

Multiple Frame Survey Descriptive Statistics:
Unweighted Means of Study Variables by State

Variable	Means			
	Overall	Nebraska	North Dakota	South Dakota
Sample Size	(860)	(347)	(251)	(262)
Fee/AUM	10.49	11.98	8.21	10.71
# Pairs	60.08	62.51	48.49	67.94
# Cows	1.86	1.72	1.58	2.30
# Bulls	1.31	1.04	1.61	1.39
# Heifers	11.39	17.69	4.65	9.53
# Steers	11.07	22.61	3.18	3.34
# Calves	.45	.30	.85	.28
Pair AU's	72.10	75.01	58.19	81.57
Bull AU's	1.71	1.35	2.09	1.81
Heifer AU's	7.98	12.38	3.25	6.67
Steer AU's	7.75	15.83	2.23	2.34
Calves AU's	.14	.09	.26	.08
Pair Days	114.41	112.42	123.29	108.53
Cow Days	8.60	5.84	15.67	5.49
Bull Days	51.39	34.09	77.21	49.58
Heifer Days	22.39	27.45	20.85	17.15
Steer Days	10.77	16.06	8.13	6.29
Calves Days	1.62	1.42	2.45	1.09
Total Days Grazed	145.59	154.81	136.01	142.55
# Acres	1083.43	910.49	354.04	2011.24
Total Head	146.25	168.37	108.85	152.78
# Sheep	.58	0.	2.00	0.
# Horses	.14	.16	.20	.06
# Dairy Cattle	.09	.03	.12	.15
# Other Beef Cattle	20.86	4.18	2.66	60.39
# Other Animals	0.	0.	.01	0.
Total Beef Cattle	86.17	105.86	60.36	84.81
Total AU's	91.52	106.38	67.60	94.77
Total Other Liv.	21.68	4.37	4.98	60.60
Acres/Head	20.76	13.47	3.53	46.92
Pair AM's	368.23	411.92	268.07	406.32
Cow AM's	8.25	5.41	7.47	12.77
Bull AM's	7.15	6.37	8.35	7.02
Heifer AM's	38.81	61.65	11.06	35.14
Steer AM's	39.63	82.88	7.46	13.17
Calf AM's	.59	.49	1.01	.34
Total AM's	462.66	568.72	303.42	474.76
# Landlord Ser.	1.34	1.75	1.21	.93

Definition of variables included on Table 1 in Appendix C.

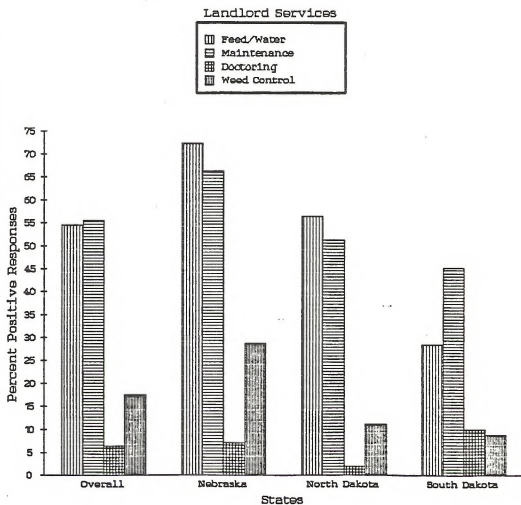
TABLE VI

Multiple Frame Survey Descriptive Statistics:
Percent Positive Response and Unweighted Mean Fee Paid by State

Variable	Percent Positive Responses			
	Overall	Nebraska	North Dakota	South Dakota
Sample Size	(860)	(347)	(251)	(262)
Recurring Lease	86.9	91.1	88.4	79.8
Landlord Provides:				
Feed/Water	54.5	72.3	56.6	28.6
Maintenance	55.5	66.3	51.4	45.2
Doctoring	6.5	7.2	2.0	10.0
Weed Control	17.6	28.8	11.2	8.9
Presence of				
Other Livestock	12.2	9.5	17.1	11.0
Public Land				
Permittee	15.0	13.5	16.3	15.8
Means				
Fee/AUM	10.49	11.98	8.21	10.71
# Landlord Ser.	1.34	1.75	1.21	.93

Figure III

Multiple Frame Survey Descriptive Statistics
Percent Positive Responses by State



An examination of the costs associated with various lease arrangements showed that ranchers paid premiums for leases with certain characteristics. If the lease was nonrecurring in nature, the lessee paid a premium of approximately 25 percent. Maintenance, doctoring, and weed control services commanded premiums of approximately 20 to 25 percent. There was no significant increase in the cost of leases where the landlords provided feed and water, which may indicate that water occurred naturally on the majority of the tracts leased. The questionnaire, however, did not distinguish between leases with natural water sources and those where water had to be provided by more costly methods.

Regression and correlation analyses were performed to measure the effect of various leasing characteristics on the grazing lease rate (Table VII). Due to the very large sample sizes, most correlation coefficients greater than ± 0.10 are significantly different than zero using a 95 percent confidence level. Since correlations less than ± 0.10 are indicative of a weak relationship, only correlations greater than ± 0.10 are considered in the discussion.

The length of the lease and the recurring nature of the lease tended to decrease the cost, while landlord services provided, with the exception of feed and water, tended to increase the cost. The size of the land area, the size of the cattle herd involved, the presence of livestock other than cattle, and the rental of public grazing land did not appear to be related to the cost. The basis of payment, e.g., per acre or per

TABLE VII

Multiple Frame Survey Correlation Analysis:
Correlation Coefficient with Fee/AUM

<u>Variable</u>	<u>Overall</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>
TOTAL Days Grazed	-.163	-.193	-.234	-.241
# Acres	.010	-.020	.116	-.005
# Pairs	.010	-.028	-.023	.022
Total Head	.034	-.028	-.013	.035
Recurring Lease	-.160	-.231	-.165	-.136
Landlord Provides:				
Feed/Water	.066	-.024	.070	.079
Maintenance	.203	.177	.264	.092
Doctoring	.122	.190	.021	.021
Weed Control	.127	.162	-.065	.040
# Landlord Ser.	.199	.196	.161	.093
Presence of				
Other Livestock	.028	.149	.071	.096
Public Land Perm.	.005	.041	-.028	.028
Total AU's	.036	-.030	-.018	.044
Acres/Head	.000	-.045	.174	-.015
Total AM's	-.011	-.070	-.079	-.034

head/month, significantly affected the fee paid per AUM. Contradictory results between analyses, however, indicated that there may be a problem with converting the fee paid from per acre to per AUM.

The 51-County Study: Of the 7,900 ranchers interviewed in the 51-County Study, approximately 2,700 leased private grazing lands. The same statistical analyses performed in the MF Survey were also conducted on the data obtained from the private grazing land leases. As in the MF Survey, significant variation in leasing operations existed among the States (Table VIII). The fees paid per AUM were lower in Montana, Wyoming, and North Dakota than the fees paid in South Dakota and Nebraska. Wyoming had the largest leases and North Dakota had the smallest in terms of total head and number acres. Montana and North Dakota had leases which ran a shorter number of days, probably due to their harsher climates. Nebraska and South Dakota leases contained much higher acres per head ratios than leases for Montana, North Dakota, and Wyoming.

Over 80 percent of the leases were recurring, while approximately half of the landlords provided feed or water and maintenance (Table IX and Figure IV). Few landlords provided doctoring for the livestock or weed control, while few lessees grazed livestock other than cattle. About half of the leases were on a per acre basis, with the remainder split evenly between per pair and per head per month. Few leases utilized per AUM for payment. Significant differences in fee paid per AUM were found between States and between the bases of payment.

TABLE VIII

51-County Study Descriptive Statistics:
Means of Study Variables
Not Adjusted for Nonrespondents

Variable	Overall	Montana	Nebraska	North Dakota	South Dakota	Wyoming
Sample Size	(2679)	(375)	(382)	(714)	(820)	(388)
Feed/AUM	9.75	7.54	11.72	9.53	10.59	8.57
# Cows	64.93	70.07	53.47	55.42	65.96	85.85
# Bulls	1.59	1.21	1.30	4.84	6.28	13.96
# Heifers	14.52	12.64	11.43	7.02	11.26	11.29
# Steers	10.88	2.18	28.52	3.19	8.93	20.18
# Calves	1.93	.97	2.37	1.85	.31	6.00
Pair AU's	77.79	84.08	64.17	66.50	79.16	103.02
Bull AU's	2.06	2.87	1.44	2.48	1.80	1.68
Heifer AU's	10.16	8.85	9.54	4.92	9.56	22.98
Steer AU's	7.82	1.53	19.97	2.23	6.25	14.13
Pair Days	107.85	95.82	98.71	112.55	112.09	11.80
Cow Days	13.21	14.06	9.20	14.98	112.49	107.61
Bull Days	48.06	52.93	46.80	60.80	30.20	19.88
Heifer Days	32.23	29.44	29.33	29.74	29.52	48.09
Steer Days	13.51	8.19	25.92	6.07	11.25	24.88
Calves Days	3.89	2.96	5.46	3.25	.99	10.55
Total Days Grazed	150.14	141.68	158.91	136.18	154.66	165.83
# Acres	1954.51	1850.14	1174.50	695.55	2455.41	4099.88
# Shearhead	164.77	163.76	153.87	129.63	162.49	245.94
# Sheep	10.32	2.98	0.78	.29	15.56	34.57
# Horses	.46	.27	.28	.21	.52	.83
# Dairy Cattle	.14	0.0	0.0	.21	.92	.83
# Other Beef Cattle	20.50	0.0	3.53	1.90	57.80	12.39
# Other Animals	.07	0.0	0.0	0.0	.21	0.0
Total Beef Cattle	99.94	33.69	100.40	74.21	96.53	160.10
Total AU's	104.41	103.24	97.12	81.52	103.14	157.55
Total Other Live.	31.48	2.35	3.61	3.33	74.46	47.81
Protein/Head	13.96	13.96	54.36	13.29	74.89	21.55
Protein/AUM	39.29	42.04	390.22	303.81	421.15	650.56
Cow AM's	39.70	29.68	69.39	31.77	31.77	69.01
Bull AM's	9.62	11.58	7.78	24.67	46.99	13.72
Heifer AM's	56.20	48.06	45.56	21.95	21.66	71.63
Steer AM's	37.54	5.97	99.64	10.41	.42	21.63
Calf AM's	3.77	1.48	3.75	1.83	.99	982.36
Total AM's	557.62	515.56	553.94	370.83	540.25	982.36
# Landlord Ser.	1.20	.92	1.59	1.41	.99	1.16

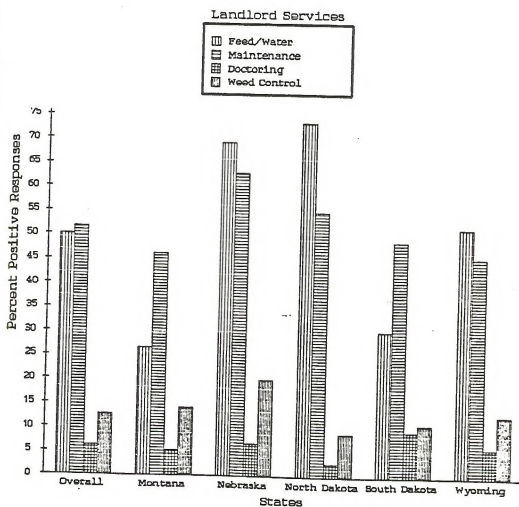
TABLE IX

51-County Study Descriptive Statistics:
Percent Positive Responses and Mean Fee Paid by State
Not Adjusted for Nonrespondents

Variable	Overall	Percent Positive Responses				
		Montana	Nebraska	North Dakota	South Dakota	Wyoming
Sample Size	(2679)	(375)	(382)	(714)	(820)	(388)
Recurring Lease	81.6	75.9	92.1	86.3	73.3	85.3
Landlord Provides:						
Feed/Water	50.0	26.5	69.4	73.5	30.4	51.8
Maintenance	51.7	46.2	63.1	54.9	48.9	45.7
Doctoring	6.3	5.3	6.8	2.9	9.6	6.2
Weed Control	12.7	14.2	20.2	9.1	11.0	13.9
Presence of						
Other Livestock	18.5	6.4	9.7	22.3	22.1	24.2
Public Land	42.8	69.6	28.0	24.7	43.1	63.7
Permittee						
Means						
Fee/AUM	9.75	7.54	11.72	9.53	10.59	8.57
# Landlord Ser.	1.20	.92	1.59	1.41	.99	1.16

Figure IV

51-County Study Descriptive Statistics
Percent Positive Responses by State



As in the MF Survey, certain leasing characteristics commanded premium payments. Nonrecurring leases commanded a premium of roughly 20 percent over recurring leases. Leases in which the landlord provided feed and water, maintenance, doctoring, and weed control had premiums ranging between 10 and 25 percent. In the more arid States of Montana and North Dakota, the rates of the leases which contained feed and water were higher, being roughly 30 and 25 percent, respectively.

A correlation analysis conducted to measure the effect of various leasing characteristics on lease rates produced the following results. (As in the previous analysis, only statistically significant variables with correlations of ± 0.10 or greater are discussed.) The length of the lease, the recurring nature of the lease, and the use of public land were negatively correlated with the price, while the number of landlord services provided were positively correlated with the price. Correlation analyses between various leasing characteristics and the fee bases again produced contradictory results, which reaffirmed the possibility that problems exist with conversion of other fee bases to a per AUM rate. In summary, the results of the 51-County Study closely parallel the results of the MF Survey.

Comparison of the Northern Great Plains Study, the Multiple Frame Survey, and the 1981 June Enumerative Survey

The data derived from the NGP Study also were compared to data from the 1981 JES to determine if private grazing land lease rates for North and South Dakota and Nebraska were inflated, thus driving up the public land lease rate. This comparison also would help determine if the smaller sample responding to the JES was representative of the ranching population.

Table X shows a comparison of the rates paid by operators interviewed through the various studies. The ranchers' primary contention, that higher lease rates in the eastern parts of the Dakotas and Nebraska were driving up statewide private grazing land lease rates, was not supported when the results of the 51-County Study were compared to the statewide MF Survey data (Section A). In Nebraska and North Dakota, ranchers in the 51-County Study area paid rates higher than the rates derived from the statewide MF Survey. South Dakota rates were the same for both the 51-county and the statewide areas. Only in North Dakota was the difference between rates statistically significant, i.e., the absolute value of the difference was larger than two times the standard error.

Similar results were obtained when data acquired through the MF Survey were broken out by counties and compared to the statewide results (Section B). Ranchers in North and South Dakota who were in both counties included in the 51-County Study and the MF Survey paid rates higher than the statewide rate, although ranchers in the 51-county areas of Nebraska paid less than the statewide rate. Again, only the difference in rates in North Dakota was statistically significant.¹⁸

TABLE X

Comparative Analysis of Private Grazing Land Lease Rate Data¹
Obtained Through the Northern Great Plains Study (51-County Study
and Multiple Frame Survey) and the 1981 June Enumerative Survey

A. Comparison of State-specific data from the NGP Study with three-State MF Survey, by three States

	51-County Operators ²	MF Survey State Level	Standard Error	Difference in Rates
			\$	
Nebraska	11.70	11.30	.29	+ .40
North Dakota	9.60	7.90	.29	+1.70
South Dakota	10.30	10.30	.34	0

B. Comparison of 3-State MF Survey data for the 51 counties with MF Survey statewide data

	51-County	MF Survey Standard Error	State Level	Standard Error	Difference in Rates
Nebraska	10.60	1.34	11.30	.29	- .70
North Dakota	10.50	.63	7.90	.29	+2.60
South Dakota	10.60	.34	10.30	.34	+ .30

C. Comparison of the three-State MF Survey with the 1981 JES, by three States

	MF Survey State Level	Standard Error	1981 JES State Level	Standard Error	Difference in Rates
Nebraska	11.30	.29	13.81	.39	-2.51
North Dakota	7.90	.29	8.69	.44	- .79
South Dakota	10.30	.34	11.97	.41	-1.67

D. Comparison of the NGP Study with the 1981 JES, by five States

	51-County Operators ²	1981 JES State Level	Standard Error	Difference in Rates
Montana	7.40	9.40	.17	-2.00
Nebraska	11.70	13.81	.39	-2.11
North Dakota	9.60	8.69	.44	+ .91
South Dakota	10.30	11.97	.41	-1.67
Wyoming	8.60	7.93	.46	+ .73

¹All data relate to lease rates paid in 1981. Estimates are adjusted by weights representing the sampling stratum.

²Rates for the targeted 51 counties were based on a complete enumeration of all operators with 100+ cattle in these counties (except for nonresponse) and thus have no significant standard errors.

The comparison of the results of the statewide MF Survey with those of the JES for the three States surveyed (Section C) shows that the JES rates were significantly higher in Nebraska and South Dakota than the statewide average rate paid per AUM from the MF Survey. In North Dakota, the JES rate also was higher than the MF rate although the difference was not significant. Section D shows that in all States except Wyoming, the JES rate is significantly different from the complete enumeration of 100+ cattle operators in the 51 counties. In Wyoming, the JES rate is lower, but not significantly.

This difference between the NGP Study and the JES does not necessarily validate or invalidate use of the JES as a measure of private grazing land lease rates in the grazing fee formula. First, the differences may result from the difference between the type of question asked the respondents in each survey. The NGP Study asked a rancher what he or she was actually paying per AUM to lease grazing lands. The JES asked cattle operators to estimate rates being paid in their area. Answers to the first question are likely to produce information on all existing leases, which will result in an AUM price based on an averaging of new and old lease rates. Answers to the second question are likely to produce information on what is being paid for new leases.

Second, as noted previously, the JES provides a survey estimate of private grazing land lease rates. The grazing fee formula process converts that information to a measurement of the percent change, i.e.,

the FVI. The JES was not designed to measure the absolute FMV lease rate. Therefore, even though the estimated dollar amount of a private grazing land lease rate may be higher or lower than the actual lease rate, the rate of change from year to year may still be correct, provided that the rate of discrepancy between the two remains constant. It should be noted that a similar disparity was found when the 1966 Western Livestock Survey average grazing land lease rate of \$1.79 was compared to the average 1964-1968 March Farm Report Questionnaire lease rate of \$3.65.¹⁹

Conclusions from the Northern Great Plains Study

The NGP Study was designed to answer three major questions:

1. Did inclusion of private grazing land lease rates in the eastern portions of the Dakota's and Nebraska result in too high a public land grazing fee?
2. What factors influence the grazing rental rates and to what degree?
3. Does the sampling technique used in the JES and/or the use of a reporter question result in a biased response to questions designed to measure the private grazing land lease rate?

As discussed in the previous section, the NGP Study was successful in determining that data on private lease rates from the eastern portions of the three States did not inflate the data used to determine the grazing fee for the National Grasslands.

Data from the NGP Study can be used to draw preliminary conclusions on which factors influence private grazing land lease rates. These conclusions are described in detail in Appendix C, "A Statistical

Analysis of the Northern Great Plains Study." The conclusions, however, must be considered hypothetical since they are based on the problematical conversion of all leases to a per AUM basis.

In general, the NGP Study supported the finding that the tenure of a lease affected its price. Rates for short-term leases in the area were substantially higher than long-term rates, commanding premiums of roughly 25 percent (MF Survey) and 20 percent (51-County Study). The inclusion of landlord services provided also affected lease price. In the 51-County Study, the average rental rate for a lease with any service provided was approximately 25 percent higher than for a lease with no landlord services provided. The presence of other livestock did not influence rental rates; the average rental rate when other livestock (including dairy cattle) grazed was roughly equivalent to the average when other livestock were not present. The basis for the lease rate, e.g., per AUM or per acre, significantly affected the rate charged as well as the rights and obligations associated with the lease for the lessor and lessee.

The results of the study were less clear in response to the question of reporter bias. A definite disparity existed between the average grazing values reported in the 1981 JES and NGP Study, with the JES values being statistically significantly higher. This disparity may be explained by two factors: the use of a reporter question on the JES where all

respondents do not have firsthand knowledge of grazing lease rates and the difference between the questions asked. The first of these explanations was tested through the 1982 and 1983 JES's, as described in the following section.

IV. JUNE ENUMERATIVE SURVEYS FOR 1982 AND 1983

Due to the different lease rates obtained through the NGP Study and the JES, the SRS recommended that the JES be expanded to determine if an explanation of the bias and a measure of its consistency could be determined. To test the hypothesis that the reported disparity was the result of a bias created by uninformed respondents, a question was added to the 1982 and 1983 JES's to determine which of the respondents actually leased grazing lands. The results of these surveys for the Western United States are shown in Figure V. In 1982, a year in which the average private grazing land lease rate declined, the respondents who leased private lands reported a lower rate than the respondents who did not lease private lands. In 1983, a year in which the average private lease rate increased, the situation was reversed with those who leased private grazing lands reporting a higher rate than those who did not lease these lands.

A possible explanation of these results is that operators who actually lease private lands are more sensitive to swings in the market than operators who do not lease these lands. The results, by State, are shown in Tables XI and XII. When the 1982 and 1983 data are examined by State, no clear trends are shown. Respondents that lease private grazing lands report rates lower than the rates estimated by respondents who do not lease in half of the States and higher rates in the other half of the States. Therefore, no clear bias is evident in the responses.

Figure V
1982 and 1983 Average
June Enumerative Survey (JES) Values

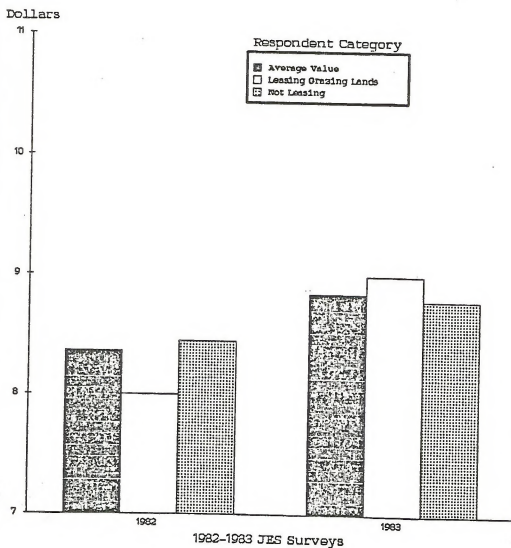


TABLE XI
GRAZING LEASE RATES AND NUMBER OF REPORTS
BY RESPONDENT CATEGORY

1982 JES

Number of Reports by Respondent Category

State	-----AUM-----			----Cow/Calf-----			-----Per Head-----		
	Total/Paid/Not Paid ¹			Total/Paid/Not Paid			Total/Paid/Not Paid		
Arizona	7	1	6	1	-	1	-	-	-
California	88	21	67	37	11	26	17	10	7
Colorado	93	23	70	75	19	56	19	9	10
Idaho	86	21	65	43	12	31	8	3	5
Montana	91	21	70	84	17	67	8	6	2
Nevada	10	3	7	2	-	2	1	-	1
New Mexico	62	18	44	22	9	13	7	3	4
Oregon	80	25	55	47	44	27	22	10	12
Utah	51	12	39	22	4	18	21	11	10
Washington	37	9	28	26	27	19	32	14	18
Wyoming	<u>43</u>	<u>31</u>	<u>62</u>	<u>71</u>	<u>23</u>	<u>48</u>	<u>18</u>	<u>8</u>	<u>10</u>
Total	698	185	513	427	119	308	155	74	79

Grazing Charges by Respondent Category

State	-----AUM-----			----Cow/Calf-----			-----Per Head-----		
	Total/Paid/Not Paid			Total/Paid/Not Paid			Total/Paid/Not Paid		
Arizona	2.53	1.99	3.02	4.50	-	4.33	-	-	-
California	9.23	9.44	9.20	11.22	11.95	11.09	8.57	7.42	9.74
Colorado	9.04	7.80	9.52	10.61	9.18	11.22	9.14	8.87	9.44
Idaho	7.98	7.22	8.28	9.53	10.20	9.17	9.05	8.09	9.13
Montana	8.90	9.76	8.74	10.67	11.35	10.55	8.11	8.12	7.50
Nevada	5.70	6.91	4.11	9.79	-	9.58	12.00	-	12.00
New Mexico	6.76	7.51	6.04	8.12	10.86	7.46	6.49	5.08	7.18
Oregon	7.70	8.08	7.62	9.72	8.45	10.03	8.78	7.75	9.40
Utah	9.24	9.22	9.30	9.66	10.10	9.58	6.86	7.79	5.99
Washington	6.67	5.56	6.92	7.76	6.31	8.15	10.17	10.12	10.18
Wyoming	<u>8.46</u>	<u>6.78</u>	<u>8.71</u>	<u>10.11</u>	<u>7.68</u>	<u>10.49</u>	<u>7.24</u>	<u>7.90</u>	<u>6.92</u>
Average	8.36	8.00	8.45	10.14	9.80	10.22	9.04	8.59	9.33

¹Respondents in paid category are those respondents who actually leased grazing lands.

Respondents in not paid category are those respondents who did not lease grazing lands and estimated rates paid.

TABLE XII
GRAZING LEASE RATES AND NUMBER OF REPORTS
BY RESPONDENT CATEGORY

1983 JES

Number of Reports by Respondent Category

State	-----AUM-----			-----Cow/Calf-----			-----Per Head-----		
	Total/Paid/Not Paid'	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	
Arizona	6	3	3	6	3	3	13	5	8
California	72	24	48	41	14	27	40	14	26
Colorado	65	22	43	56	18	38	20	9	11
Idaho	48	14	34	28	7	21	12	2	10
Montana	130	38	92	113	32	81	12	3	9
Nevada	9	2	7	7	2	5	3	2	1
New Mexico	24	9	15	18	7	11	29	17	12
Oregon	53	15	38	45	14	31	24	5	19
Utah	29	9	20	14	7	7	18	11	7
Washington	57	27	30	24	10	14	23	5	18
Wyoming	<u>90</u>	<u>40</u>	<u>50</u>	<u>55</u>	<u>24</u>	<u>31</u>	<u>37</u>	<u>20</u>	<u>17</u>
Total	583	203	380	407	138	269	231	93	138

Grazing Charges by Respondent Category

State	-----AUM-----			-----Cow/Calf-----			-----Per Head-----		
	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	Total/Paid/Not Paid	
Arizona	4.15	3.64	4.20	4.98	4.37	5.04	7.09	5.86	7.86
California	9.98	9.78	10.05	12.37	10.68	12.98	8.84	11.47	8.60
Colorado	8.70	6.86	9.40	10.59	7.72	11.56	8.32	8.07	8.49
Idaho	8.02	7.55	8.17	8.85	8.96	8.81	7.37	8.48	6.96
Montana	9.23	9.60	9.11	11.12	11.55	10.97	9.99	8.68	10.00
Nevada	4.56	2.57	5.80	4.20	3.08	5.15	7.94	7.64	8.00
New Mexico	6.63	8.19	6.19	10.08	9.51	10.34	5.99	5.53	6.25
Oregon	7.24	7.74	7.13	8.58	8.91	8.49	7.22	7.23	7.22
Utah	7.24	8.19	6.96	9.37	9.40	9.34	5.52	4.28	8.64
Washington	9.65	10.86	9.18	8.18	8.48	8.07	12.44	13.66	12.10
Wyoming	10.02	10.36	9.93	12.12	12.42	12.00	8.28	7.53	9.40
Average	8.85	9.00	8.80	10.32	10.09	10.40	8.62	7.93	8.86

¹Respondents in paid category are those respondents who actually leased grazing lands.

Respondents in not paid category are those respondents who did not lease grazing lands and estimated rates paid.

Lack of any clear respondent bias may indicate that the reported differences are a result of the difference between the estimated rates (based on new lease rates) and actually paid rates (average of old and new lease rates). This theory is supported by comparing the 1966 Western Livestock Survey average grazing land lease rate of \$1.79 with the average 1964-1968 March Farm Report Questionnaire lease rate of \$3.65. Further analysis of the appropriateness of the use of the FVI, as derived from the JES, will be discussed in the next section using information gathered during the grazing rental appraisal project.

The FVI may be an inaccurate measure on grounds other than respondent bias. Except for the NGP Study, all private grazing land lease rate information collected since 1979 has been gathered through the JES. The validity of that information for extrapolation to all private grazing land leases may be questionable since the JES restricts the question on average charges in the area to charges per AUM and per cow with nursing calf. In addition, the JES restricts the sample to the portion of the population in the sample area to those who can or care to respond in these categories. The results of the 1979 through 1983 JES's are shown in Table XIII and Figure VI. An attempt to improve the JES data base was made in 1983, when a discrepancy between the questions asked to the normal sample and to the large-scale cattle operators was noted. Large-scale operators were being asked to estimate charges on a per head per month basis in addition to the per AUM and per cow with nursing calf. In 1983, the JES was changed so that both groups were asked to respond on all three bases. The change accounts for the large increase in per head per month responses in 1983; thus, responses for 1983 are probably more representative of the true population than the responses of prior years.

Figure VI
Reported Grazing Land Lease Rates
June Enumerative Survey for 1979 to 1983

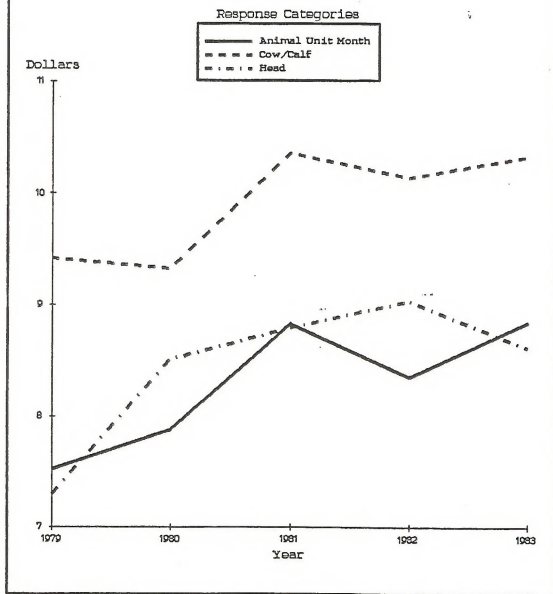


TABLE XIII

Private Grazing Land Lease Rates--June Enumerative Survey
Reported Grazing Rental Rates

Year	AUM	Cow/Calf	Head
1979	7.53	9.42	7.30
1980	7.88	9.33	8.52
1981	8.83	10.36	8.80
1982	8.36	10.14	9.04
1983	8.85	10.32	8.62

Expanded Number of Responses

Year	AUM	Cow/Calf	Head
1979	32,647	16,933	765
1980	38,603	21,322	1,051
1981	38,351	20,108	1,163
1982	33,440	21,159	1,567
1983	29,696	21,939	7,583 ¹

¹Question on average rate per head per month only asked large-scale cattle operators from 1978 - 1982. In 1983, the question was included on all survey forms. See Appendix B for details on sample methodology.

V. A COMPARISON OF THE FAIR MARKET VALUE APPRAISAL AND
THE JUNE ENUMERATIVE SURVEY

In 1982, the BLM and the Forest Service initiated a joint appraisal of the fair market rental value of public rangelands in the 16 Western States and two counties containing National Grasslands in Texas. The premise of the appraisal was that the fair market rental value of lands administered by the BLM and the Forest Service for grazing could be determined through the examination of the lease rate for comparable non-Federal grazing lands (non-Federal lands include lands owned and leased for grazing by private individuals, railroads and other corporations, and States).

During their joint appraisal, the BLM and the Forest Service collected information on 47,918 leases for State, private, railroad, corporate, and public grazing lands. This information was sorted to eliminate leases for which the lessor did not intend to collect FMV and leases where a per head charge could not be computed. The sorting categories, and the number of leases included in each, are presented in Table XIV. The 8,296 leases in the data base accounted for 9,053 observations. The slightly greater number of observations are a result of some leases containing more than one animal type (e.g., a lease containing cattle and yearlings).

Data for leases remaining in the data base were next sorted by animal class, that is, according to mature animals, yearlings, and sheep. (A breakdown of leases by animal class is also provided in Table XIV.) The

TABLE XIV
DESCRIPTION OF THE APPRAISAL DATA BASE

<u>Lease Category</u>	<u>Number of Leases</u>
All leases	47,918
Leases where lessor did not intend to collect fair market value	-1,156
Leases where price could not be computed on a per head/month basis	-1,009
Administrative leases	<u>-37,789</u>
Leases remaining in data base	8,926
<u>Observations by Animal Class</u>	
Leases for grazing by mature animals	6,417
Leases for grazing by yearlings	1,966
Leases for grazing by sheep	<u>670</u>
Total leases by animal class	9,053*

*There are 127 duplicates (i.e., leases where two animal classes are recorded on one lease) in the data set.

8,926 leases remaining in the data base after these sorts were further segregated into leases containing Federal grazing lands (897 observations) and all other leases (8,029 observations). In addition, the leases where the lessor performed the day-to-day care of the animals (1,680 observations) were excluded from the data base in portions of the analysis to see if this factor influenced the results.

To eliminate some of the variation in the data, data sets for each pricing area were "clipped," with the top and bottom 15 percent removed. This resulted in four data sets, both a clipped and unclipped data set for all categories of mature animals, and a clipped and unclipped data set for only non-Federal leases. Finally, the four data sets were sorted to create four additional data sets that eliminated leases where the lessor provided the day-to-day management of the livestock, since these "take-ins" were clearly not comparable to leases on the Federal lands (a total of eight separations of the appraisal data were examined). To test the validity of the JES, a correlation analysis was performed on the means of the variables (AUM, cow-calf, and head) in the JES and the data sets described above. The data were compared with the JES on a State-by-State and westwide basis, year by year. Because of the small number of observations, data on yearlings were only examined on a westwide basis. Data on sheep were excluded because of the small number of observations on a yearly basis.

Table XV shows the results of this analysis on the State-by-State basis. The correlations were generally poor, with little of the variability being explained. If we assume that the appraisal data set represents the accurate

TABLE XV
CORRELATION OF THE APPRAISAL VARIABLES WITH THE JES
STATE-BY-STATE ANALYSIS

<u>Appraisal Data Sets</u>	-----JES-----		
	AUM	Cow/Calf	Head
Mature Animals-All Classifications (AC)	0.175	0.333	0.252
Mature Animals-AC-Clipped Data	0.468	0.455	0.119
Mature Animals-AC Non-Federal Only	0.319	0.517	0.184
Mature Animals-AC Non-Federal, Clipped Data	0.302	0.466	-0.005
Mature Animals-except Take-ins, AC	0.110	0.234	0.169
Mature Animals-ex. Take-ins, Clipped Data, AC	0.448	0.396	.097
Mature Animals-ex. Take-ins, Non-Federal	0.212	0.390	0.020
Mature Animals-ex. Take-ins, Non-Fed., Clipped	0.172	0.265	-0.252

data, the JES would appear to be a poor indicator of the actual prices. The clipped data set generally correlated with the JES better than the unclipped data set. Because of the large amount of variability, the clipped data set probably provides a better measure of the mean price than the unclipped data sets. There is some difference in the correlations between the AUM and cow-calf data sets, with the cow-calf data set having slightly better correlation. There is a high internal correlation between the AUM and the cow-calf value, $r = 0.806$, which means that the numbers are fair proxies for each other. The internal correlation between the AUM and the per head value is low, $r = 0.414$. The per head values also showed little correlation with the appraisal data set. Figure VII compares the JES's AUM values to the means of the data for clipped, non-Federal leases, and State-by-State for 1983. The appraisal report is primarily based on these leases.

The correlation between the yearly change in the data in the JES and the appraisal was also computed for key variables (Table XVI). Again, the correlations were disappointing, with the JES also appearing to be a poor indicator of the rate of change on a State-by-State basis. The correlation for the change in the JES's per head value with the change in the appraisal data base was negative, i.e., when the actual value per mature animal increases, the JES per head value decreases.

As shown on Table XVI, the correlations improve significantly when only the westwide averages are examined. The correlation of the entire data base with the JES's AUM value was 0.987. Clipping the data base reduced the

Figure VII

1983 Fair Market Appraisal Mean Values
and 1983 June Enumerative Survey

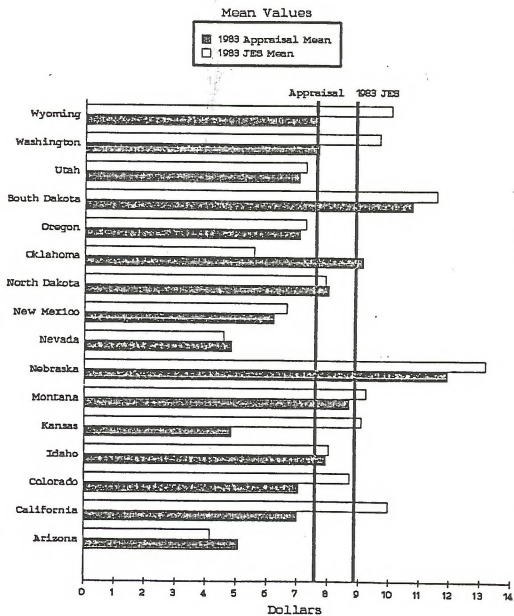


TABLE XVI

CORRELATION OF THE APPRAISAL VARIABLES WITH THE CHANGE
IN THE JES VALUES ON A STATE-BY-STATE BASIS

Correlation of the change in mature animals, clipped data with change in the
JES's AUM value = 0.239

Correlation of the change in mature animals, non-Federal leases, and clipped
data with change in the JES's AUM value = 0.142

Correlation of the change in mature animals, except take-ins and clipped data
with change in the JES's AUM value = 0.166

Correlation of the change in mature animals, clipped data with change in the
JES's per head value = -0.205

Correlation of the change in mature animals, non-Federal leases, and clipped
data with change in the JES's per head value = -0.239

Correlation of the change in mature animals, except take-ins and clipped data
with change in the JES's per head value = 0.366

TABLE XVII
CORRELATION OF THE APPRAISAL VARIABLES WITH THE JES
WESTWIDE ANALYSIS

<u>Appraisal Data Sets</u>	-----JES-----		
	AUM	Cow/Calf	Head
Mature Animals-All Classifications (AC)	0.987	0.919	0.665
Mature Animals-AC-Clipped Data	0.877	0.951	0.780
Mature Animals-AC Non-Federal, Clipped Data	0.978	0.950	-0.605
Mature Animals-except Take-ins, AC	0.402	0.283	0.158
Mature Animals-ex. Take-ins, Clipped Data, AC	0.847	0.767	.505
Mature Animals-ex. Take-ins, Non-Federal	0.767	0.673	0.262
Mature Animals-ex. Take-ins, Non-Fed., Clipped	0.887	0.925	-0.514
Yearlings, ex. Take-ins	-0.379	-0.253	-0.815
Yearlings, ex. Take-ins, Clipped Data	-0.559	-0.483	-0.879
Yearlings, ex. Take-ins, Non-Federal	0.079	0.235	-0.376
Yearlings, ex. Take-ins, Non-Federal, Clipped	0.162	0.332	0.150

correlation to 0.877, but the elimination of Federal leases again raised the correlation to 0.978. Hence, it would appear that the JES is a fairly good indicator of westwide trends for mature animals.

Correlations with the JES's per head values were generally much poorer than correlations with the AUM or cow-calf values. It is interesting to note that the highest correlations on a per head bases are the correlations with the mean prices for yearlings. This would appear to be reasonable since most yearling leases are on a per head basis. However, the negative coefficients are contrary to what is intuitively logical (as the actual price goes up, the JES value goes down) and indicate problems with the use of the JES.

As shown in Table XVIII, the relationship of the change in the JES values to the yearly change in the appraisal values is also very strong, with a correlation of 0.974 for the total data base and correlation of 0.984 for the clipped, non-Federal, excluding take-ins data base. Generally, the entire data base, including take-ins, was more correlated with the JES than the data bases that excluded the take-ins.

The JES has only included a question on private grazing rates since 1978. It is interesting to note that the difference in the mean values in 1983 between the JES and the appraisal is small (westwide \$7.80 per head--appraisal compared to \$8.85 per AUM--JES) as shown in Figure VII. This contrasts sharply with some of the other studies discussed in this paper. For example, the difference between the 1966 Western Livestock Survey (WLS) and the General Farm Questionnaire was over 200 percent (\$1.79 WLS compared to \$3.65

Table XVIII

CORRELATION OF THE APPRAISAL VARIABLES WITH THE
CHANGE IN THE JES VALUES ON A WESTWIDE BASIS

Correlation of the change in mature animals, clipped data with change in the
JES's AUM value = 0.974

Correlation of the change in mature animals, except take-ins and clipped data
with change in the JES's AUM value = 0.984

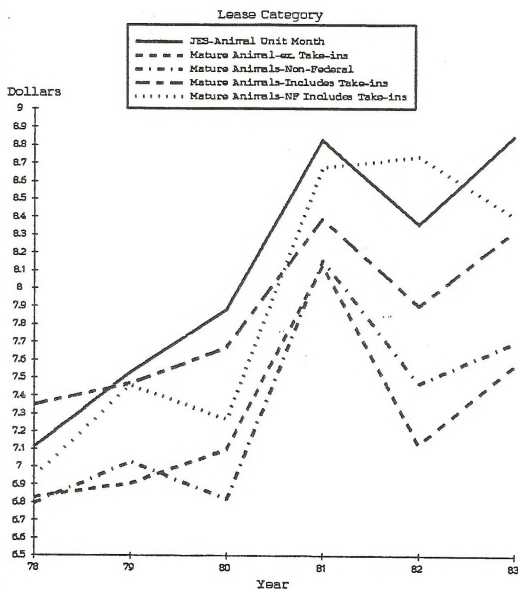
Correlation of the change in mature animals, clipped data with change in the
JES's per head value = 0.001

Correlation of the change in mature animals, non-Federal leases, except
take-ins and clipped data with change in the JES's per head value = -0.053

Correlation of the change in yearlings, except take-ins and clipped data with
change in the JES's AUM value = -.053

Correlation of the change in yearlings, except take-ins and clipped data with
change in the JES's per head value = -.938

Figure VIII
Appraisal Grazing Land Lease Rates and
June Enumerative Survey for 1979 to 1983



in the General Farm Questionnaire). This may indicate that although the JES appears to be a good indicator of values in the short run, longrun adjustments may be necessary.

Figure VIII shows the JES's AUM values and some of the different data base mean values westwide for the years 1978 to 1983. The Figure VIII illustrates the general correlation in the movement or rate of change between the appraisal data bases and the JES.

An analysis was also conducted to determine if the respondents who leased grazing, as determined by the additional questions in the 1982 and 1983 JES surveys, responded more correctly than those who did not lease grazing. The results of this analysis are shown on Table IXX. Generally, the responses of those that leased grazing were slightly better than those who did not lease, but the difference was not very great.

A better result was obtained when the entire appraisal (all of the years from 1977 to 1983) was compared to the 1983 JES results. This is also shown in Table IXX. The much higher correlations may indicate that the respondents are basing their answer on past knowledge as well as up-to-date knowledge. Hence, the reported rate would tend to be higher than the actual rate in times of declining prices and lower than the actual rate in times of increasing prices.

Conclusions from the Comparison of the Appraisal to the JES

The JES appears to be an adequate measure of the rate of change in private grazing land lease rates on a westwide basis. However, the data on a State-by-State basis does not show good correlations with the JES. This may indicate that the current use of the JES is appropriate (i.e., as a westwide indication of the rate of change), but a more geographically specific use of the JES would be inappropriate. Data on yearlings is not conclusive, and an alternative measure of value to the JES would be appropriate. Some of the other problems with the use of this index will be discussed in the next section.

VI. PRIVATE GRAZING LAND LEASE RATES DATA PROBLEMS AND RECOMMENDATIONS

The following section discusses the problems associated with the derivation of the FVI and presents suggested solutions. Since most of the problems are interrelated, this section is necessarily redundant.

Definition of Proper Lease Rate--Blended Versus New Lease Rate: Little attention has been given to the question of whether the private grazing land lease rate should be based on a lease rate that blends new and old lease rates, or the current new lease rate. The proper theoretical measure of FMV is the new lease rate. To quote Beattie:

"... 'what is being paid for new leases' is the relevant information, 'not some blending' of old and new lease rates. The private market, as opposed to public resource allocation and valuation mechanisms, tends to incorporate new information into the pricing process quickly. Therefore, economic expectations leading to economic actions are based largely on recent prices."²¹

Based on the appraisal data, the JES appears to be a fairly good measure of the change in new lease rates on a westwide basis. There is some indication, however, that the responses may be based in part on past knowledge.

Definition of the Appropriate Market Pricing Unit: As demonstrated, considerable confusion exists over which pricing unit should be used in the fee formula. Since 1979, the government has been using the reported AUM rate, ostensibly based on the agencies unit of charge. However, the definition of an AUM used by the SRS and "commonly understood in the Western United States" is not the definition contained in the PRIA. While the PRIA

talks in terms of an AUM, the pricing unit defined in the PRIA is actually a per head per month charge. Cows with nursing calves, bulls, dry cows, and yearlings are all charged for one AUM of grazing. An additional complication is introduced when the NGP Study indicates that the pricing unit reported in the market and the level of services may be correlated. This is a particularly bothersome problem in the long run if the level of services changes over time. The only way to keep the indexing accurate over the long-term will involve periodic updating of the base value (updates every 5 to 10 years).

The AUM and cow-calf value reported in the JES are highly correlated with each other and the means of the appraisal data for mature animals on a per head basis. Hence, use of indices from either the JES's AUM or cow-calf data series may be a fair approximation to the actual value. However, the JES per head rate does not appear to be a good indicator of value. Yearling rates present special problems of estimation since no data series provided by the JES appears to be a good indicator of these values.

Definition of Proper Lease Rate--Level of Landlord Services: The public grazing lands and the private grazing lands both have some level of landlord services present. The relevant private lease rate is the rate on lands with relevant landlord services comparable to those provided on public lands. A discussion of the comparability of public and private grazing lands and relevant landlord service (i.e., those landlord services that effect value) can be found in the appraisal report.²² There is some evidence based on changes in pricing units and the relative difference in rates between 1966 and 1983, that the amount of services and restrictions on both classes of property may have changed over time, which could invalidate a long term FVI.

However, use of the FVI appears to be appropriate in the short term based on the high degree of correlation with the appraisal values.

Use of a Reporter Question: The use of a reporter question has been recognized as a potential problem for many years. Again, quoting Beattie:

"My reaction to this procedure is not favorable. To think that degrees of freedom could be increased by asking all the others what they think the 9% are paying is nonsense. Given that those who actually know is not an empty set, it seems obvious that data from a few individuals who do know is always preferable to a large sample of data from those who don't know. Only if no one knows does a larger sample of opinion about the facts seem preferable. If trying to ascertain weight of an object would one opt for the reporting of a few individuals with access to scales or the opinion of a large number of people who may have heard about the nature of the object in question? The answer appears obvious. Increasing the sample size may be called for in certain situations; however, there are limits on what are acceptable ways of increasing the number of data points."²³

If the appraisal data set is used as a standard, the analysis shows that the persons that leased land were more likely to provide a correct answer to the reporter question than those who did not lease land. Hence, it may be best to restrict the questionnaire to those who lease lands. However, given the good correlation between the westwide rates of change in values, this refinement may not be necessary if a westwide average is desired.

The analysis of the data shows that the JES is not accurate on a State-by-State basis, even if the questionnaire is limited to those who lease lands. Limiting the questionnaire to actual leases of land negotiated in the current year is estimated to cost an additional \$60,000 yearly, and it would result in a very low response level. Since the response level is likely to be so low as to not permit State-by-State numbers, this improvement would probably not be justified.

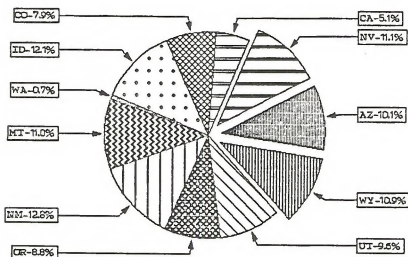
Sample Size: The use of a reporter question has been defended on the grounds that it is necessary to include operators without firsthand knowledge to increase the sample size. The size of the sample must be defined for the geographic area on which the data are used. If a single grazing rate is to be continued, the smaller sample, including only those who lease private grazing lands may be acceptable. However, if the population is further restricted to those who have new leases in the current year, the JES sample would not be large enough to provide a valid data set. The analysis of the JES against the appraisal data indicates that restricting the reporter question to operators that lease land does not result in much improvement in the reported values.

Proper Weights: Currently, the JES is weighted by the number of operators with cattle in each State. Prior to this, the weighting was done by the number of responses to the 1966 Western Livestock Survey. Both weighting methods give high weights to States such as California and Colorado, with large numbers of farms and low public land acres; and very low weights to States such as Nevada, Arizona, and Wyoming, which have low numbers of farms and high numbers of public land AUM's. This is shown in Figure IX. This problem is vastly compounded when the data is expanded to cover the 16 Western States. As shown in Figure X, the additional States (North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma) would represent 40 percent of the JES weighting, although they only contain 4 percent of the public land AUM's.

Alternatives that could be considered include surveys weighted by the number of public AUM's or the number of public land acres in the State. This alternative weighting system, however, would mean that the greatest weights

Figure IX
Public Land AUM's and Weights Used
in the 1982 June Enumerative Survey
11 Western States

Public Land Animal Unit Months



Weights Used in June Enumerative Survey

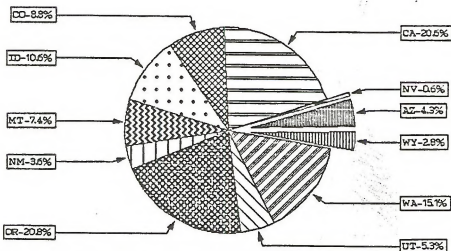
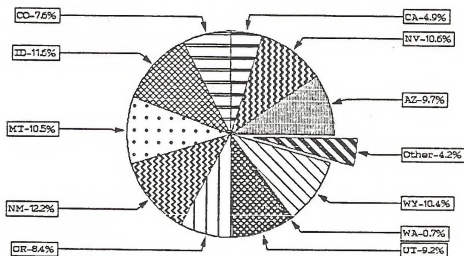
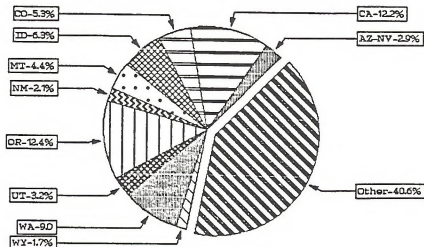


Figure X
Public Land AUM's and Weights Used
in the 1982 June Enumerative Survey
16 Western States

Public Land Animal Unit Months



Weights Used in June Enumerative Survey



are being placed on the areas with the least data. Again, if the JES is continued to be used as a measure of the rate of change westwide, weighting may not be as great a problem. However, it would be appropriate to base the weights on the 11 rather than the 16 Western States since 94 percent of the public land AUM's are in the 11 Western States.

VII. CONCLUSIONS

As the results show, considerable confusion exists about the proper data to be used to construct a FVI for use in a grazing fee formula. Part of the problem lies in the lack of knowledge about the public grazing lands and their comparability with the leased private grazing lands. To correct this problem, the BLM and the Forest Service have completed an appraisal of the fair market rental value of public grazing lands. This was a massive effort involving the gathering of a data base on approximately 47,000 leases (75 percent of the grazing leases) in 355 counties in the Western United States. The results of the appraisal are presented in a separate report.

A comparison of the appraisal data and the JES shows that at least, in the short run, the FVI is a good measure of the rate of change in the grazing leases on a westwide basis. The data will not support use on a State-by-State basis. Further analysis of the data would have to be completed to determine if regionalization of the data to the pricing areas determined in the appraisal is appropriate. (The initial analysis indicates it is probably not appropriate to regionalize the data to the pricing areas.)

The JES's AUM and cow-calf values are highly correlated, so either measure is appropriate for use as the base for an index. The JES's value per head is not a good measure of the grazing rates determined by the appraisal. In addition, the appraisal yearling rates are poorly correlated with any of the JES values. A separate means of updating yearling values may need to be considered.

VIII. END NOTES

¹N. K. Roberts and Mardell Topham, Discovering Grazing Values, Utah Agricultural Experiment Station, Ag Ec Series 65-3, Logan, Utah, 1965.

²United States Department of the Interior, Bureau of Land Management, and United States Department of Agriculture, U.S. Forest Service, "Grazing Fee Program," Handout prepared by the Division of Range Management for the August 5, 1968, meeting of National Conservation Organizations, Washington, D.C., July, 1968, pp. 4-5.

³Earl E. Houseman, et al., "Special Report on the Grazing Fee Study," a report prepared by a Technical Committee from Economic Research Service, Forest Service, and Statistical Reporting Service, United States Department of Agriculture; Bureau of Land Management, United States, Department of the Interior; and Bureau of the Budget, Nov. 29, 1968, p. 3.

⁴Bureau of Land Management and U.S. Forest Service, "Grazing Fee Program," p. 5.

⁵United States Department of the Interior, Bureau of Land Management, "Background Paper; BLM Grazing Permit Sales Price," Division of Range, Washington, D.C., n.d., p. 3.

⁶John Trierweiler, et al., "Review of Public Land Grazing Fees," a report prepared by a Technical Committee from Economic Research Service, Forest Service, and Statistical Reporting Service, United States Department of Agriculture; and Bureau of Land Management, United States Department of the Interior, Nov. 15, 1976, p. 19.

⁷United States Department of Agriculture, Statistical Reporting Service, "Farm Report" Questionnaire, Washington D.C., 1975. (A copy of the questionnaire is included as Appendix A.)

⁸The Secretary of Agriculture and the Secretary of the Interior, Study of Fees for Grazing Livestock on Federal Lands, Government Printing Office, Washington, D.C., Oct. 21, 1977, pp. 3-33.

⁹Trierweiler, et al., p. 20.

¹⁰"Report on Private Grazing Lease Rates" submitted to the Senate Public Lands Subcommittee of the Interior and Insular Affairs Committee, April 30, 1976; as quoted in Gordon Kearn, "Preliminary Draft Review of the Technical Committee Meeting on Grazing Fees," Denver, Colorado, August 25, 1976.

¹¹Trierweiler, et al., p. 20.

¹²Ibid., pp. 27-28.

¹³United States Department of Agriculture, Statistical Reporting Service, as reported in the Secretary of Agriculture and the Secretary of the Interior, Study of Fees for Grazing Livestock on Federal Lands, Government Printing Office, Washington, D.C., Oct. 21, 1977, p. C-24.

¹⁴United States Department of Agriculture, Statistical Reporting Service, "1977 December Livestock Survey Questionnaire", Washington D.C., 1977. (A copy of the questionnaire is included as Appendix A.)

¹⁵United States Department of Agriculture, Statistical Reporting Service, "1977 December Livestock Survey Questionnaire-Interviewer's Manual," Washington, D.C., 1977, p. 75.

¹⁶Grazing fees on National Grasslands are based on a formula similar to the PRIA formula. Index values are based on data from the 9 Great Plains States rather than the 11 Western States used in the PRIA fee formula.

¹⁷Only operators with 100+ cattle were interviewed as an economy measure. Based on the 1978 Census of Agriculture, operators with 100+ cattle represent approximately 45 percent of the total number of operators with 20+ cattle in the area.

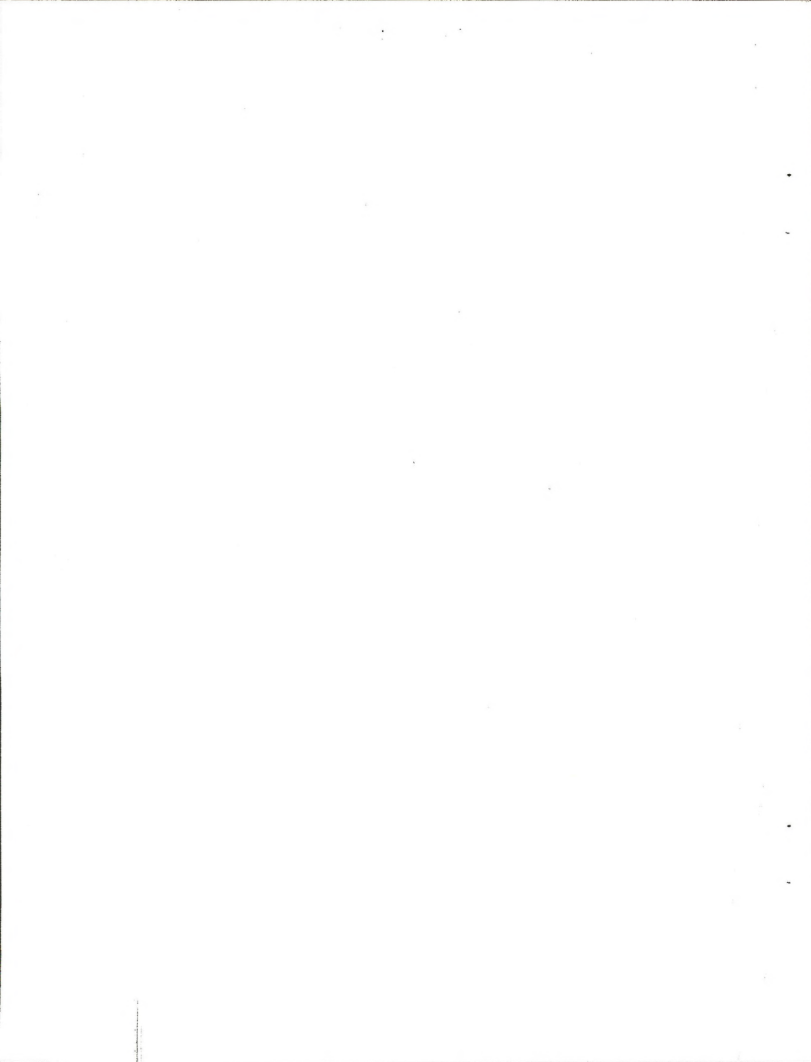
¹⁸One of the factors that may account for the difference between the 51-county enumeration and the MF Survey data for the same area is the different populations interviewed (i.e., operators with 100+ cattle in the 51-county enumeration and a sample of all operators in the MF Survey).

¹⁹The average 1964 to 1965 private grazing land lease rate of \$3.65 became the base value for the derivation of the FVI; FVI = Current Private Grazing Land Lease Rate - \$3.65

²⁰SPSS for Honeywell DPS and 66 GCOS Systems, University of Kansas; explanation of computer programs is contained in Norman H. Nite, C. Hadlai Hull, Jean G. Jenkins, Karin Steinbrenner, and Dale H. Bent, Statistical Package for the Social Sciences, McGraw-Hill, 1975.

²¹Bruce Beattie, "Grazing Fee Review and Evaluation Studies: Discussion of Papers," presented at the Rangeland Policy and Range Economics Research Symposium, Laramie, Wyoming, July 13, 1983, p. 3.

²²Ibid, p. 2.



APPENDIX A

DERIVATION OF THE FORAGE VALUE INDEX (FVI)

The following is a description of the derivation and history of the FVI, the actual figures used in the FVI are shown in Table A-1.

From 1969 to 1978, the FVI (originally called the Range Forage Index) was derived using the March Farm Report Questionnaire which was sent to a nonprobability, general purpose list of grain farmers, dairy farmers, fruit farmers, etc. The question asked the respondents of the March Survey to estimate the average rate in the locality of grazing cattle on nonirrigated lands on a per head per month basis. The results of the survey were published in the "Farm Real Estate Market Developments." A westwide average was developed from the reported prices by weighting each State price by the number of observations in the 1966 Western Livestock Grazing Survey. To develop the index, the average rate from 1964 to 1968 of \$3.65 was set equal to 100.

Criticism of this methodology was centered around the use of a nonprobability survey, the use of a reporter question (average rates in the locality), and the use of a per head per month unit. The Bureau of Land Management and the Forest Service conducted several studies of alternative methodologies (alternative surveys, questions, and pricing units).

The June Enumerative Survey (JES) was chosen as the survey vehicle for use in the FVI starting in 1979. A complete description of the JES methodology is described in Appendix B. Because of poor response rates in the tests, the reporter question was continued. The JES added additional pricing unit questions, i.e., per animal unit month (AUM), per cow-calf pair, and per head. The per AUM was adopted as the data series for use in the FVI. The \$3.65 base value was retained.

Table A-1. The FVI

Data Year	Private Grazing Rate	FVI	Source of Data
1964-1968	\$ 3.65	100	March General Farm Survey
1969	3.82	105	
1970	4.05	111	
1971	4.06	111	
1972	4.17	114	
1973	4.57	125	
1974	5.82	159	
1975	5.75	158	
1976	6.37	175	
1977	7.06	193	
1978	7.11	195	
1979	7.53	206	
1980	7.88	216	June Enumerative Survey
1981	8.83	242	
1982	8.36	229	
1983	8.85	242	

APPENDIX B
JUNE ENUMERATIVE SURVEY

The following is an explanation of the complete methodology used in the JES:

Sample Methodology. The sample population is drawn on an area frame basis as follows. The 48 conterminous United States are divided into land-use classifications, i.e., Indian lands, intensive agricultural lands, urban lands, etc., using topographical maps, recent satellite photos, and other existing data. Every acre of land is classified into defined strata. A stratified random sample of the areas is then drawn. The sample areas are called segments. These segments range in size from 0.1 to 2 square miles in residential and cultivated strata. Segments in open range and woodland areas may vary from 1 to 100 square miles. The number of areas sampled within each land-use classification is based on the probability that areas in that land-use classification contain agricultural activities. For example, urban areas are sampled much less intensively than cultivated cropland.

Five complete random samples are normally drawn for each land-use classification. Each year, one sample set (20 percent) of the operators being interviewed leave the sample population and a new set (20 percent) enters the population. This normally results in a completely new population every 5 years. The purpose of this is to reduce respondent burden and pick up new data sources while promoting the stability of the estimates.

Normally, all ranchers and farmers in the segments are interviewed. For example, 8,336 farmers and ranchers were interviewed in the 922 areas in

California that were sampled. In sparsely populated areas in the Western United States, larger areas are drawn to increase the probability of locating a farmer or rancher to interview. If the land being sampled is public land, the allotment is used as the sample area. If a group of permittees share the allotment (up to five of the permittees are in the allotment), a sample of five permittees to be interviewed is drawn. Each year, about 128,000 operators in the United States are interviewed; 24,000 (22 percent) of those sampled are in the 16 Western States.

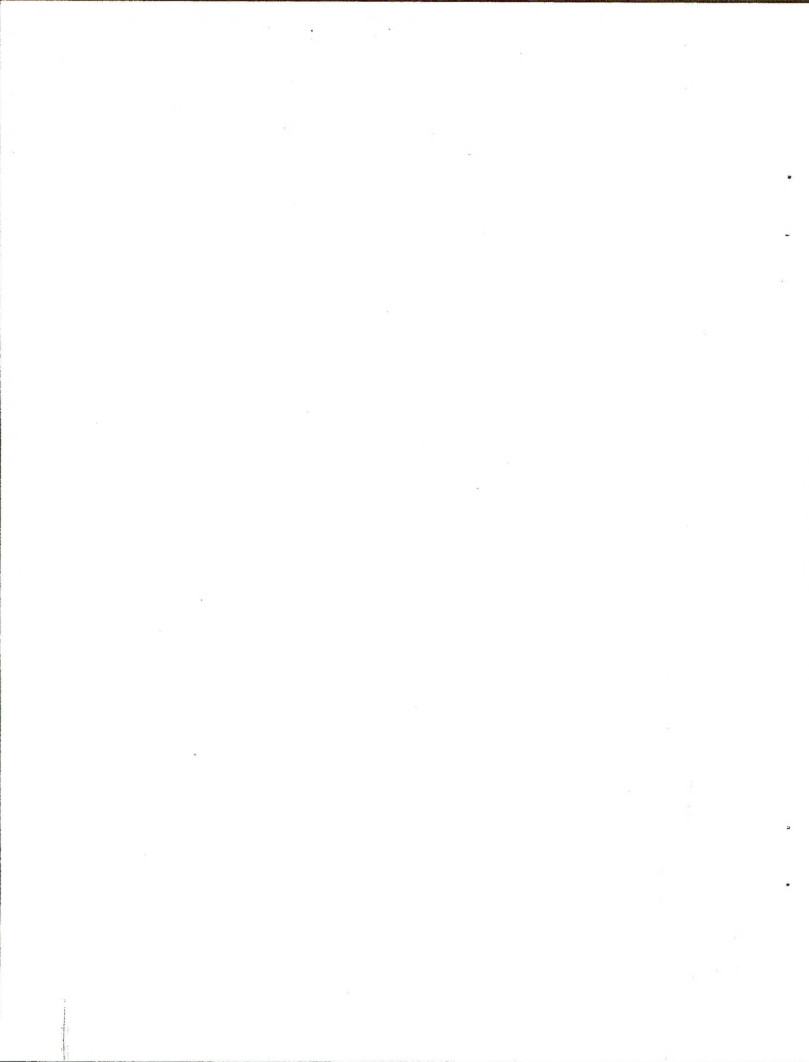
To increase the accuracy of the estimate of cattle numbers, a sample of operators with large-scale livestock operations is also interviewed. The size of the sample of large-scale operators (operators with over 500 head of cattle) is determined on a State-by-State basis and is in proportion to the number and size of the operations in that State. Generally, all operators in the West with over 1,000 cattle are personally interviewed, while one-fourth to one-half of the operators with 500 to 1,000 cattle are interviewed.

Both the operators who live inside the sample area (resident farm operators) and operators with large-scale livestock operations are asked the questions on the private grazing lease rates. Nonresident operators are not asked the questions on the grazing rates. If public land is drawn in the area sample, the public land permittees are not asked the questions on the private grazing land lease rates.

All interviews are conducted by the National Association of State Departments of Agriculture (NASDA). The NASDA has 2,000 part-time employees who work for the Statistical Research Service (SRS) on this and other agricultural

surveys. All enumerators are required to know something about agriculture. The SRS is responsible for the training and quality control of the enumerators. Quality control is maintained by the SRS by resurveying a selected sample of operators to determine if they understood the questions asked by the enumerators and if they provided the answers.

These survey results are summed and expanded by weighting factors based on the probability of selecting sampling units to produce the data that are provided in the final reports.



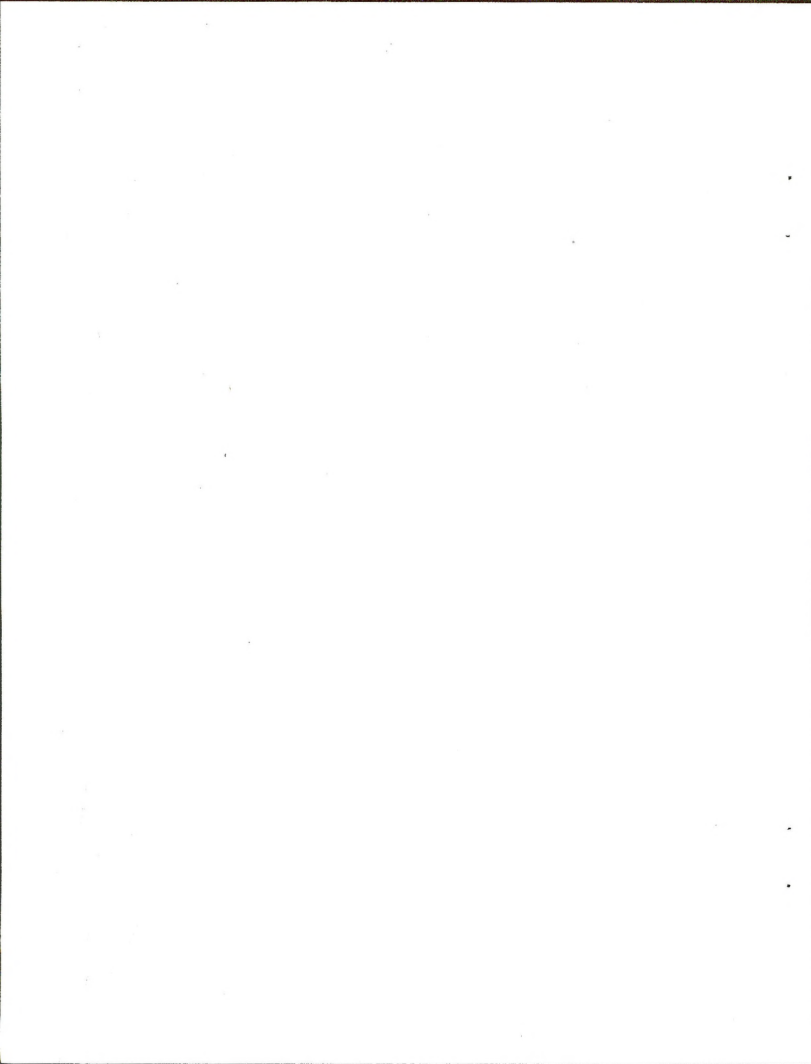
APPENDIX C

A Statistical Analysis of
The Northern Great Plains Study

by

Michael Garratt
Senior Statistician

Bureau of Land Management
Division of Scientific Systems
Denver Service Center
Denver, Colorado 80225



I. Introduction

The Northern Great Plains (NGP) Study was conducted in 1981 to identify factors that influence the rates for leasing private grazing lands. A survey of ranchers in the NGP was conducted by the U.S. Department of Agriculture (USDA) Statistical Reporting Service (SRS) and key entered for computer analysis. The data set was extensively edited to eliminate coding and data entry errors and unreasonable values. This edited data set was acquired from the SRS and entered on the Bureau of Land Management (BLM) Honeywell DPS-8 computer. A statistical analysis using the Statistical Package for the Social Sciences was performed to identify and measure factors influencing private grazing land rental values.

The NGP Study included two components--a Multiple Frame (MF) Survey and a 51-County Study. The MF Survey was a random sample of all the ranchers in the States of Nebraska, North Dakota, and South Dakota. The 51-County Study was a complete enumeration of all cattle operators with more than 100 cattle located with a target 51 county area covering portions of five States--Montana, Nebraska, North Dakota, South Dakota, and Wyoming. Of the 4,212 operators interviewed in the MF Survey, 867 leased private grazing land; 7,884 operators interviewed in the 51-County Study leased private grazing land.

	51-County Area	3-State MF Survey
Livestock Operations	7,884	4,212
Completed Questionnaires	6,591 (84%)	3,107 (74%)
Refusals	661 (8%)	734 (17%)
Inaccessible	364 (5%)	192 (5%)
Out of Business	268 (3%)	179 (4%)
Operators Leasing Grazing Land	1,780 (27%)	585 (19%)
# Lease Arrangements Analyzed	2,679	860

The questionnaire used to solicit information concerning each cattle operation was administered through a phone interview format. The questionnaire determined if the operator leased private grazing land. If private land was leased, the fee paid and the basis for payment were determined. Additional questions examined the size of the operation in terms of the number and type of animals, the number of acres, the number of days grazed, and the location of the operation. Other questions explored the characteristics of the lease arrangement, such as landlord services provided and whether the lease was recurring.

Both the SRS and the BLM conducted a statistical analysis of the NGP Study data. The objective of the SRS analysis was to compare the NGP Study data with the 1981 JES and to examine the use of the entire State data as compared to the use of data from only the target area. The MF Survey sample was stratified by the total cattle herd size of the ranching operation. The SRS used weights representing the proportion of operators in each strata sampled in computing their estimates.

The BLM analysis focused on the factors influencing private land grazing fee rates. The analysis utilized analysis of variance, correlation and regression, and factor analysis. For computational simplicity and consistency, the MF Survey was treated as a simple random sample in the BLM analysis. Similarly, in the 51-County Study, the SRS included a correction for survey nonrespondents in their estimates while the BLM elected to omit this correction. The differences in the two approaches leads to minor differences in the numerical estimates provided in the two analyses.

For analysis purposes, the SRS converted the fee paid for the lease to dollars per animal unit month (AUM), which the fee arrangement used by Federal agencies to lease grazing lands. Fee arrangements converted to an AUM basis included dollars per acre, per pair per month (a cow and a calf), and per head per month. The majority of private leases were on a per acre basis. A cow was considered one animal unit (AU). All other types of cattle were converted to AU's, the number of days grazed converted to months, and the results used to compute AUM's.

A set of variables for the NGP Study was extracted from the field questionnaire for analysis. Supplementary variables were calculated from this data set. Table 1 provides the abbreviated variable names used in the analyses and a label or description of each variable.

As seen in the table, the majority of the variables were common to the MF and 51-County data sets. The abbreviated variable names are used in all subsequent tables for brevity. The reader should refer back to Table 1 to find the appropriate label when a variable's meaning is in question. Categorical (Yes-No) variables are so indicated in parentheses after the variable description. The variables named DSTATE and DBASIS are dummy variables used in the regression analysis designating the State of the grazing location and the basis for the fee paid. The formula used to calculate the supplementary variables are given in Table 2.

In order to facilitate discussion of the analysis results, the MF Survey and 51-County Study will be discussed separately due to the different nature of the populations sampled. The discussion begins with a breakdown of the analysis from the MF Survey and continues with the 51-County Study.

II. The Multiple Frame Survey

Table 3 presents the overall means and the means for each State by each variable for the MF Survey. A quick examination of this table provides a profile of a typical cattle operation. Immediately, one will recognize the significant variation between the nature of operations in different States. Table 4 provides a quick synopsis of the varying size of cattle operations between States. Ranching operation leases in the more southern States--Nebraska and South Dakota--are larger than in North Dakota. More head and AU's are grazed, more acres are grazed, and the total days grazed is larger. The fee paid per AUM is higher in Nebraska and South Dakota than North Dakota, while the acres per head goes counter to this trend.

Table 5 examines the nonquantitative characteristics of the leases. Categorical variables were coded as one for a positive response and zero for a negative response. The vast majority of the leases are recurring in nature. The questionnaire asked if the lessor provided each of four services: feed, water or minerals, maintenance, doctoring, or weed control. The majority of lessors provided feed or water and maintenance of the property. The questionnaire, however, did not distinguish between natural water sources and water provided by costlier methods. Few landlords provided doctoring or weed control. The land was used primarily for cattle grazing with few other types of livestock represented. Few leasees rented other public or Federal land.

In Table 6, the variation in the fee per AUM paid is examined for the various bases for payment used. The majority of lease rates are determined on a per acre basis, while less than 1 percent are based on per AUM. The per acre leases are the cheapest per AUM, presumably since the lessor does not control the number of head the lessee places on the property. In relating the basis used to the landlord services provided, it appears that landlords providing doctoring prefer to charge on some type of per animal basis since the cost of their service is directly related to the number of animals. In addition, lessees grazing other livestock in addition to cattle are usually charged on a per pair basis. The majority of landlords provide one or two services, which most typically are feed or water and property maintenance.

Table 7 examines the cost associated with the characteristics of the lease arrangement. If the lease is not recurring in nature, the lessee pays a premium of approximately 25 percent. The difference between the costs for the landlord providing feed or water is insignificant. This may indicate that water occurs naturally on the majority of the tracts leased. The maintenance, doctoring, and weed control services command payment of a premium of 22, 26, and 18 percent, respectively. The privilege of grazing other livestock in a cattle lease and the use of public land for grazing do not appear to influence cost.

Table 8 gives the actual fee paid for each basis by each State and overall. Generally, rates were highest in Nebraska and lowest in North Dakota. In order to make comparisons between States and the payment basis simultaneously, the fee paid was converted to a per AUM basis using the formula given in Table 2.

Tables 9 and 10 examine the variation in the fee paid per AUM by state and the basis of payment. The analysis of variance (ANOVA) revealed per AUM to be the most expensive basis and per acre to be the least expensive basis, while the per pair and per head per month bases fell between these extremes. Table 10 shows the results of a Duncan's Multiple Range Test (MRT) performed at the 5 percent level of significance for the four bases of payment. The numbers given in parentheses in the bottom part of the table represent the codes of the basis means that were found to not be significantly different by the Duncan's Test for the overall means and for each State.

A correlation and regression analysis were performed to determine those factors effecting grazing fee rates. Table 11 gives the results of the correlation analysis.

The time length in days and the recurring nature of the lease tend to decrease the cost while landlord services provided, with the exception of feed or water, tend to increase the cost. The size of the land area, the size of cattle herd involved, the presence of livestock other than cattle, and the rental of public grazing land do not appear to be related to the cost. Tables 12 through 15 show the results of the stepwise regression analysis. Table 12 gives the regression using the entire sample, and Tables 13 through 15 give the regressions for Nebraska, North Dakota, and South Dakota, respectively. Since the fee paid for each State was significantly different, a separate equation was derived for each State. Only those variables with significant correlations were used as independent variables in the regression analysis to

reduce the colinearity problem. These variables and their correlation coefficients are given in the beginning of the table; the R square and the prediction equation for the fee paid per AUM are given at the end. The R-squares are quite low in all cases. This may suggest an appraisal approach may be more appropriate for examining private grazing land rental fee structures than a statistical sampling and prediction approach.

Since the basis of payment significantly affected the fee paid per AUM, separate correlation analyses were performed for the fee per AUM for the per acre basis and the combined per pair per month and per head per month bases. The results are given in Table 16. The per acre basis is positively correlated with the total head, total animal units, total animal months, and some of the landlord services and negatively with a recurring lease arrangement. It can be concluded that the basis of payment changes the factors effecting the grazing fee rates. Due to the small correlation coefficients, no further step-wise multiple regressions were performed.

Table 16 suggests that the acres per head (carrying capacity) is positively correlated with the fee per AUM for the per acre basis. Intuition would suggest the opposite. Therefore, in Table 17 the correlation coefficients with the actual fee reported for the per acre basis leases are presented. The results show the acres per head to be negatively correlated as expected. The number of acres grazed and the use of public land are negatively correlated with the fee paid, both of which are significant deviations from Table 16. These differences between Tables 16 and 17 indicate that there may be a problem with the conversion of the fee paid from per acre to per AUM.

In Table 18, correlation coefficients for the per pair and per head per month basis were computed for the reported fee paid. In Table 18 and in the per pair or per head section of Table 16 there is only one correlation greater than 0.2. Since no explicit relationships are defined, it is difficult to ascertain the reliability of the conversion from the actual fee paid to the fee per AUM for the per pair or per head per month bases.

Finally, a factor analysis was performed to examine the inherent variability within the data set as summarized in Table 19. Sixty-one point eight (61.8) percent of the variation is explained by the characteristics of the cattle herds being grazed, i.e., the number of cattle, calves, steers, heifers, bulls and cows. Of the remaining variability between cattle operators, 13.5 percent is a function of the number of acres grazed, 8.9 percent is a function of the number and type of landlord services, 6.0 percent is a function of the basis for payment, 4.5 percent is a function of the State in which the grazing takes place, 3.5 percent is a function of the number of days grazed, and the remaining 2.0 percent is a function of the number of other livestock grazing on the leased land.

In summary, the MF Survey shows a significant difference in private grazing land rental rates in three States. The majority of the lessors charge on a per acre basis, with per acre leases being cheapest per AUM. Landlord services, with the exception of feed or water, increase the price paid with the majority of lessors providing doctoring charging on a per animal basis. Recurring leases and leases for more total days are cheaper

while the size of the tracts of land or the size of the herd does not effect the price paid. Additional analyses suggest there may be some problem in the conversion from the fee paid as reported to the calculated fee per AUM for leases paid using per acre as the basis.

III. The 51-County Study

This section presents the analytical results of the 51-County Study. The same analyses used in the MF Survey were also conducted for the 51-County Study. Table 20 presents the overall means and the means for each of the five States for each variable. A quick examination reveals the diversity of the lease operations between States. Table 21 is an extraction from of six variables Table 20 key to the size of cattle grazing leases. An examination of Table 21 reveals the fee paid per AUM to be lower in Montana, Wyoming, and North Dakota than in South Dakota and Nebraska. Wyoming has the largest leases and North Dakota has the smallest in terms of total head and number of acres. Montana and North Dakota have leases which run a shorter number of days, probably due to their harsher climates. Nebraska and South Dakota have a much higher acres per head than Montana, North Dakota, and Wyoming.

Table 22 summarizes the nonquantitative characteristics of the leases. Over 80 percent of the leases are recurring, while approximately half of the landlords provide feed or water and maintenance. Few landlords provide doctoring for the livestock or weed control, while few lessees graze livestock other than cattle. In Montana and Wyoming the majority of lessees also lease some form of federally administered land.

Table 23 examines the variations caused by the form of the basis of payment. The mean fee paid per AUM is lower for those grazing on a per acre basis than on a per pair or per head basis. About half of the leases are on a per acre basis with the remainder split evenly between per pair and per head per month. Few leases utilize per AUM for payment. Approximately two-thirds of the landlords providing services other than doctoring charge on a per head or per pair per month basis. Since the expense of doctoring is directly related to herd size, over 90 percent of the landlords providing this service use a per pair or per head basis. Overall, the majority of landlords provide one or two services. Lessees grazing livestock other than cattle pay on a per pair per month basis in the majority of the leases. ,

Table 24 examines the cost associated with the various characteristics of the lease arrangement. Non-recurring leases command a premium of 21 percent over recurring leases. Feed or water, maintenance, doctoring and weed control command premiums of 19, 25, 19, and 8 percent, respectively. In the more arid States of Montana and North Dakota, the premiums for feed or water are 30 and 23 percent, respectively. Grazing livestock other than cattle does not affect price. Those lessees grazing public land pay 14 percent less than those without public land leases.

Table 25 shows the actual fee paid for each basis by each State and overall. Nebraska and South Dakota are generally the most expensive States, with Montana, North Dakota, and Wyoming being less expensive. In order to compare differences between States and the basis of payment, the actual fee paid was

converted to the fee paid per AUM using the formula in Table 2. These values are presented in Table 26. This data was subjected to an analysis of variance with significant differences found between states and between the bases of payment. A followup on Duncan's MRT was performed which showed all five States to be significantly different. The results of the MRT on the fee paid per AUM are given in Table 27. Overall, the price per acre, per pair per month and per head per month were all significantly different with per acre being the lowest price, and per head per month the highest price.

A correlation analysis was performed to determine those factors affecting grazing fee rates. Table 28 gives the result of the correlation analysis for the fee paid per AUM with selected variables. The length of the lease, the recurring nature of the lease, and the use of public land are negatively correlated to the price; the number of landlord services, including providing feed, water, and maintenance, are positively correlated to the price. A stepwise regression analysis was used to develop a predictive equation for the fee paid per AUM. To reduce the colinearity problem, only those variables with significant correlations were used in the regression analysis. The overall regression equation is given in Table 29.

Since the R square was only 0.21 and previous analysis had shown significant difference between States, separate regression equations were developed for each State in an attempt to improve the predictive power of the regression equations. Of the five equations given in Tables 30 through 34, the

regression equation for Montana has the largest R-square value at 0.33. Given the size of the correlation coefficients in Table 29, the low R square values from the regression analysis could be anticipated.

Since the correlation coefficients were low for the fee paid per AUM and the analysis of variance showed significant differences between the bases of payment, in Table 35, the fee paid per AUM was examined for the per acre basis and the per pair or per head per month basis. For the per acre basis the total days grazed, the landlord providing feed or water and maintenance, the number of landlord services, and the use of public land are all significant. This is basically the same as in Table 28 though the magnitude of the correlations all increased somewhat. On the other hand, for the per pair or per head per month basis, no correlations are significant. It appears that the larger correlations in Table 28 were the effect of the relationships found in the per acre leases.

To examine the effect of the conversion from the actual fee paid to the fee paid per AUM, correlations were calculated for the fee paid for each basis. Tables 36 and 37 display the results. For the per acre basis, Table 36 shows that the landlord providing feed or water and maintenance, the number of landlord services, and the use of public land are all significant. This is basically the same as Tables 28 and 35, though again the magnitude of the correlations increased over those in Table 35. The main surprise is the large change, both in magnitude and size, in the acres per head correlation. If the acres per head is taken as a measure of carrying capacity, the inverse

relationship with the fee paid in Table 36 is correct. This result contradicts with the values in Table 21 indicating there may be a problem with the conversion from the fee paid per acre to the fee paid per AUM. In Table 37 the correlation with the actual fee paid for the per pair or per head per month basis are again largely insignificant. This is in basic agreement with the results presented in Table 35.

Lastly, a factor analysis was performed in the 51 County Study data set. Seventy-seven (77) percent of the variance in the data set is attributed to the number of each type of cattle grazed, 9 percent is a function of the landlord services provided, 6.9 percent is a function of the basis of payment, 4.0 percent is a function of the total days grazed, 1.8 percent is a function of the presence of livestock other than cattle, and 1.4 percent is a function of the lessee also leasing public grazing land.

In summary, the conclusions of the 51-County Study closely parallel the results of the MF Survey. The 51-County Study shows significant differences between the five States in private grazing land lease rates. Most landlords charge on a per acre basis with per acre leases being cheapest per AUM. All landlord services increase the price paid with the majority of lessors providing doctoring, charging on a per pair or per head per month basis. Recurring leases, leases for more total days, or leases where the lessee also leases public land are less expensive, while the size of the herd or the size of the tract of land does not effect the price paid. Additional analyses suggest there may be a problem in the conversion from the fee paid as reported to the calculated fee per AUM for leases paid using per acre as the basis.

Table 1. List of Variables and Labels
(Variables Common to MF and 51C Studies)

<u>NAME</u>	<u>LABELS</u>
FEEPAID	FEE PAID AS REPORTED
FEEPAUM	FEE PER ANIMAL UNIT MONTH AS CALCULATED
NPAIRS	NUMBER OF PAIRS
NCOWS	NUMBER OF COWS
NBULLS	NUMBER OF BULLS
NHEIFERS	NUMBER OF HEIFERS
NSTEERS	NUMBER OF STEERS
NCALVES	NUMBER OF CALVES
AUPAIRS	PAIR ANIMAL UNITS
AUBULLS	BULLS ANIMAL UNITS
AUHEIFER	HEIFER ANIMAL UNITS
AUSTEERS	STEER ANIMAL UNITS
AUCALVES	CALVES ANIMAL UNITS
PAIRDAYS	NUMBER OF PAIR DAYS
COWDAYS	NUMBER OF COW DAYS
BULLDAYS	NUMBER OF BULL DAYS
HEIFDAYS	NUMBER OF HEIFER DAYS
STERDAYS	NUMBER OF STEER DAYS
CALVDAYS	NUMBER OF CALF DAYS
TOTDAYGR	TOTAL DAYS GRAZED FOR ALL CLASSES
NACRES	NUMBER OF ACRES GRAZED
TOTHEAD	TOTAL HEAD GRAZED
RECURLSE	RECURRING LEASE ARRANGEMENT (Yes-No)
FEEDH2O	LANDLORD PROVIDES FEED OR WATER (Yes-No)
MAINTAIN	LANDLORD PROVIDES MAINTENANCE (Yes-No)
DOCTOR	LANDLORD PROVIDES DOCTORING (Yes-No)
WEEDCTL	LANDLORD PROVIDES WEED CONTROL (Yes-No)
OTHRNSTK	OTHER DOMESTIC LIVESTOCK GRAZING (Yes-No)
NSHEEP	NUMBER OF SHEEP
NHORSES	NUMBER OF HORSES
NDRYCAT	NUMBER OF DAIRY CATTLE
NOTHRBFC	NUMBER OF OTHER BEEF CATTLE
NOTHRAN	NUMBER OF OTHER ANIMALS
PUBLAND	USE OF PUBLIC LAND (Yes-No)
TOTALBCG	TOTAL BEEF CATTLE GRAZED
TOTAUGR	TOTAL ANIMAL UNITS GRAZED
NLORDSER	NUMBER OF LANDLORD SERVICES (1 to 4)
TOTOLSTK	NUMBER OF HEAD OF OTHER LIVESTOCK
ACREPHD	ACRES PER HEAD
PAIRAM	PAIR ANIMAL MONTHS
COWAM	COW ANIMAL MONTHS
BULLAM	BULL ANIMAL MONTHS
HEIFERAM	HEIFER ANIMAL MONTHS
STEERAM	STEER ANIMAL MONTHS
CALFAM	CALF ANIMAL MONTHS
TOTALAM	TOTAL ANIMAL MONTHS
DBASIS1	FEE BASIS = PER ACRE
DBASIS2	FEE BASIS = PER PAIR PER MONTH
DBASIS3	FEE BASIS = PER HEAD PER MONTH

Table 1. List of Variables and Labels (Cont.)

(Variables Used Only in MF Study)

DSTATE1	STATE OF NEBRASKA
DSTATE2	STATE OF NORTH DAKOTA

(Variables Used Only in 51C Study)

DSTATE1	STATE OF NEBRASKA
DSTATE2	STATE OF NORTH DAKOTA
DSTATE3	STATE OF SOUTH DAKOTA
DSTATE4	STATE OF WYOMING

Table 2. Equations Used for Calculated Variables

$$\text{TOTDAYGR} = \text{PAIRDAYS} + \text{COWDAYS} + \text{BULLDAYS} + \text{HEIFDAYS} + \text{STEERDAYS} + \text{CALVDAYS}$$

$$\text{TOTHEAD} = (2 * \text{NPAIRS}) + \text{NCOWS} + \text{NBULLS} + \text{NHEIFERS} + \text{NSTEERS} + \text{NCALVES}$$

$$\text{TOTALBCG} = \text{NPAIRS} + \text{NCOWS} + \text{NBULLS} + \text{NHEIFERS} + \text{NSTEERS} + \text{NCALVES}$$

$$\text{TOTOLSTK} = \text{NSHEEP} + \text{NHORSES} + \text{NDRYCAT} + \text{NOTHRBFC} + \text{NOTHRAN}$$

$$\text{ACREPHD} = \text{NACRES} / \text{TOTHEAD}$$

$$\text{AUPAIRS} = 1.2 * \text{NPAIRS}$$

$$\text{AUBULLS} = 1.3 * \text{NBULLS}$$

$$\text{AUHEIFER} = 0.7 * \text{NHEIFERS}$$

$$\text{AUSTEERS} = 0.7 * \text{NSTEERS}$$

$$\text{AUCALVES} = 0.3 * \text{NCALVES}$$

$$\text{TOTAUGR} = \text{AUPAIRS} + \text{NCOWS} + \text{AUBULLS} + \text{AUHEIFER} + \text{AUSTEERS} + \text{AUCALVES}$$

$$\text{PAIRAM} = (\text{AUPAIRS} * \text{PAIRDAYS}) / 30$$

$$\text{COWAM} = (\text{NCOWS} * \text{COWDAYS}) / 30$$

$$\text{BULLAM} = (\text{AUBULLS} * \text{BULLDAYS}) / 30$$

$$\text{HEIFERAM} = (\text{AUHEIFER} * \text{HEIFDAYS}) / 30$$

$$\text{STEERAM} = (\text{AUSTEERS} * \text{STERDAYS}) / 30$$

$$\text{CALFAM} = (\text{AUCALVES} * \text{CALVDAYS}) / 30$$

$$\text{TOTALAM} = \text{PAIRAM} + \text{COWAM} + \text{BULLAM} + \text{HEIFERAM} + \text{STEERAM} + \text{CALFAM}$$

$$\text{For BASIS} = 1, \text{FEIPAUM} = (\text{FEIPAID} * \text{NACRES}) / \text{TOTALAM}$$

$$\text{For BASIS} = 2, \text{FEIPAUM} = (\text{FEIPAID} * \text{NPAIRS}) / \text{TOTAUGR}$$

$$\text{For BASIS} = 3, \text{FEIPAUM} = (\text{FEIPAID} * \text{TOTHEAD}) / \text{TOTAUGR}$$

$$\text{For BASIS} = 4, \text{FEIPAUM} = \text{FEIPAID}$$

Table 3. Multiple Frame Survey Descriptive Statistics
Unweighted Means of Study Variables by State

Variable	Overall	Means		
		Nebraska	North Dakota	South Dakota
Sample Size	(860)	(347)	(251)	(262)
FEEPAUM	10.49	11.98	8.21	10.71
NPAIRS	60.08	62.51	48.49	67.94
NCOWS	1.86	1.72	1.58	2.30
NBULLS	1.31	1.04	1.61	1.39
NHEIFER	11.39	17.69	4.65	9.53
NSTEERS	11.07	22.61	3.18	3.34
NCALVES	.45	.30	.85	.28
AUPAIRS	72.10	75.01	58.19	81.57
AUBULLS	1.71	1.35	2.09	1.81
AUHEIFERS	7.98	12.38	3.25	6.67
AUSTEERS	7.75	15.83	2.23	2.34
AUCALVES	.14	.09	.26	.08
PAIRDAYS	114.41	112.42	123.29	108.53
COWDAYS	8.60	5.84	15.67	5.49
BULLDAYS	51.39	34.09	77.21	49.58
HEIFDAYS	22.39	27.45	20.85	17.15
STERDAYS	10.77	16.06	8.13	6.29
CALVDAYS	1.62	1.42	2.45	1.09
TOTDAYGR	145.59	154.81	136.01	142.55
NACRES	1083.43	910.49	354.04	2011.24
TOTHEAD	146.25	168.37	108.85	152.78
NSHEEP	.58	0.	2.00	0.
NHORSES	.14	.16	.20	.06
NDRYCAT	.09	.03	.12	.15
NOTHRBFC	20.86	4.18	2.66	60.39
NOTHRAN	0.	0.	.01	0.
TOTALBCG	86.17	105.86	60.36	84.81
TOTAUGR	91.52	106.38	67.60	94.77
TOTLSTK	21.68	4.37	4.98	60.60
ACREPHD	20.76	13.47	3.53	46.92
PAIRAM	368.23	411.92	268.07	406.32
COWAM	8.25	5.41	7.47	12.77
BULLAM	7.15	6.37	8.35	7.02
HEIFERAM	38.81	61.65	11.06	35.14
STEERAM	39.63	82.88	7.46	13.17
CALFAM	.59	.49	1.01	.34
TOTALAM	462.66	568.72	303.42	474.76
NLORDSER	1.34	1.75	1.21	.93

Table 4. Multiple Frame Survey Size of Cattle Operations

Variable	Overall	Means		
		Nebraska	North Dakota	South Dakota
Sample Size	(860)	(347)	(251)	(262)
FEEPAUM	10.49	11.98	8.21	10.71
TOTHEAD	146.25	168.37	108.25	152.78
TOTAUGR	91.52	106.38	67.60	94.77
TOTDAYGR	145.59	154.81	136.01	142.55
NACRES	1083.43	910.49	354.04	2011.24
ACREPHD	20.76	13.47	3.53	46.92

Table 5. Multiple Frame Survey Descriptive Statistics:
Percent Postive Response and Unweighted Mean Fee Paid by State

Variable	Overall	Percent Positive Responses		
		Nebraska	North Dakota	South Dakota
Sample Size	(860)	(347)	(251)	(262)
RECURLSE	86.9	91.1	88.4	79.8
FEEDH2O	54.5	72.3	56.6	28.6
MAINTAIN	55.5	66.3	51.4	45.2
DOCTOR	6.5	7.2	2.0	10.0
WEEDCTL	17.6	28.8	11.2	8.9
OTHLSTK	12.2	9.5	17.1	11.0
PUBLAND	15.0	13.5	16.3	15.8
Means				
FeePAUM	10.49	11.98	8.21	10.71
NLORDSER	1.34	1.75	1.21	.93

Table 6. Multiple Frame Survey Cross Tabulations

Percent response (sample size - 860)

Basis	Mean FEEP/UM	State		
		Overall	Nebraska	South Dakota
Per Acre	9.21	57.1	40.6	57.6
Per Pair Per Month	11.08	25.5	34.3	24.4
Per Head Per Month	13.76	16.9	24.5	17.9
Per AUM	15.62	0.6	0.6	0.0

Category	RECURLSE	FEEDH20	MAINTAIN	DOCTOR	WEEDCTL	OTHRSLTK	PUBLAND
Per acre	60.9	47.3	47.5	17.9	35.1	27.9	43.8
Per pair per month	24.4	32.5	30.7	35.7	37.7	55.8	29.7
Per pair per month	14.2	19.7	21.4	46.4	26.5	16.3	25.8
Per AUM	0.5	0.4	0.4	0.0	0.7	0.0	0.8

MLORDSER	Overall	State			RECURLSE
		Nebraska	North Dakota	South Dakota	
0	25.0	9.8	23.5	46.9	25.8
1	33.6	32.0	42.2	27.5	35.1
2	26.6	36.3	25.9	14.3	27.0
3	11.4	17.6	6.4	8.1	9.7
4	3.3	4.3	2.0	3.1	2.4

Variable - FEEAPUM (Means)

Table 7. Multiple Frame Survey Breakdown

Category	RECURLSE	FEEDH2O	MAINTAIN	DOCTOR	WEEDCTL	OTHRSLTK	PUBLAND
No	12.72	10.15	9.36	10.32	10.17	10.41	10.44
Nebraska	15.66	12.17	10.74	11.71	11.46	11.74	11.89
North Dakota	10.36	7.86	6.92	8.19	8.33	8.38	8.17
South Dakota	12.29	10.45	10.32	10.62	10.57	10.44	10.57
Yes	10.15	10.78	11.40	13.02	11.95	10.77	10.62
Nebraska	11.61	11.90	12.61	15.37	13.24	14.26	12.49
North Dakota	7.93	8.48	9.44	9.13	7.31	7.38	7.80
South Dakota	10.31	11.38	11.19	11.51	11.97	11.87	11.25
Overall	10.49						

Table 8. Multiple Frame Survey Reported Grazing Fee Rates

Variable - FEEPAID

(Mean values with sample size in parentheses)

<u>Basis</u>	<u>State</u>			
	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>	<u>Overall</u>
Per Acre	12.82 (141)	7.97 (199)	11.87 (151)	10.56 (491)
Per Pair Per Month	15.07 (119)	8.00 (36)	12.99 (64)	13.30 (219)
Per Head Per Month	11.37 (85)	8.27 (13)	11.50 (47)	11.14 (145)
Per AUM	21.50 (2)	11.71 (3)		15.62 (5)

Table 9. Multiple Frame Survey Analysis of Variance

Variable - FEEPAUM

(Mean values with sample size in parentheses)

Basis	State			
	Nebraska	North Dakota	South Dakota	Overall
Per Acre	9.68 (141)	8.19 (199)	10.11 (151)	9.21 (491)
Per Pair Per Month	12.55 (119)	6.66 (36)	10.83 (64)	11.08 (219)
Per Head Per Month	14.74 (85)	11.99 (13)	12.47 (47)	13.76 (145)
Per AUM	21.50 (2)	11.71 (3)		15.62 (5)
Overall	11.98 (347)	8.21 (251)	10.71 (262)	10.49 (860)

Table 10. Multiple Frame Survey Duncan's Multiple Range Test

Analysis of Variance - FEEPAUM by BASIS

Level of Significance - 5%

Means Not Significantly Different for Variable - BASIS

	Code		
	1	Per acre	
	2	Per pair per month	
	3	Per head per month	
	4	Per AUM	
Overall	Nebraska	North Dakota	South Dakota
(2,3,4)	(1)	(1,2,4)	(1,2)
(1)	(2)	(3,4)	(2,3)
	(3)		
	(4)		

Table 11. Multiple Frame Survey Correlation Analysis:

Correlation Coefficient with Fee/AUM

<u>Variable</u>	<u>Overall</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>
TOTDAYGR	-.163	-.193	-.234	-.241
NACRES	.010	-.020	.116	-.005
NPAIRS	.010	-.028	-.023	.022
TOTHEAD	.034	-.028	-.013	.035
RECURLSE	-.160	-.231	-.165	-.136
FEEDH2O	.066	-.024	.070	.079
MAINTAIN	.203	.177	.264	.092
DOCTOR	.122	.190	.021	.021
WEEDCTL	.127	.162	-.065	.040
NLORDSER	.199	.196	.161	.093
OTHLSTK	.028	.149	.071	.096
PUBLAND	.005	.041	-.028	.028
TOTAUGR	.036	-.030	-.018	.044
Acres/Head	.000	-.045	.174	-.015
TOTALAM	-.011	-.070	-.079	-.034

Table 12. Multiple Frame Survey Multiple Regression
(Overall Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
PAIRDAYS	-.228
BULLDAYS	-.199
TOTDAYGR	-.163
RECURLSE	-.160
MAINTAIN	.203
DOCTOR	.122
WEEDCTL	.127
NLORDSER	.199
DSTATE1	.249
DSTATE2	-.286
DBASIS1	-.289
DBASIS3	.280

Stepwise Regression Equation
 $R^2 = .2167$

FEEPAUM = 14.18
 -.85 DBASIS1
 -2.13 STATE2
 -.02 TOTDAYGR
 +1.39 MAINTAIN
 +2.03 DBASIS3
 -1.48 RECURLSE
 +1.12 DSTATE1

Table 13. Multiple Frame Survey Multiple Regression

(Nebraska Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
PAIRDAYS	-.214
TOTDAYGR	-.193
RECURLSE	-.231
MAINTAIN	.177
DOCTOR	.190
WEEDCTL	.162
OTHLSTK	.149
NLORDSER	.196
DBASIS1	-.380
DBASIS3	.316

Stepwise Regression Equation

$$R^2 = .2414$$

$$FEEPAUM = 16.98$$

-2.73	DBASIS1
-2.88	RECURLSE
+1.61	DBASIS3
+2.05	DOCTOR
-0.01	TOTDAYGR
+1.64	OTHLSTK

Table 14. Multiple Frame Survey Multiple Regression

(North Dakota Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
NCOWS	-.104
PAIRDAYS	-.271
COWDAYS	-.121
BULLDAYS	-.159
TOTDAYGR	-.234
NACRES	.116
RECURLSE	-.165
MAINTAIN	.264
NLORDSER	.161
ACREPHD	.174
COWAM	-.110
CALFAM	.118
DBASIS2	-.119
DBASIS3	.159

Stepwise Regression Equation
 $R^2 = .2480$

FEEPAUM = 8.82
 -.02 PAIRDAYS
 +2.48 MAINTAIN
 +.36 ACREPHD
 -3.42 DBASIS2
 -.07 NCOWS
 +.001 NACRES

Table 15. Multiple Frame Survey Multiple Regression

(South Dakota Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
NCOWS	.154
PAIRDAYS	-.191
COWDAYS	.116
BULLDAYS	-.171
HEIFDAYS	.099
CALVDAYS	.121
TOTDAYGR	-.241
RECURLSE	-.136
NHORSES	-.146
NDRYCAT	.110
NLORDSER	.093
COWAM	.160
DBASIS1	-.137
DBASIS3	.148

Stepwise Regression Equation

$$R^2 = .1486$$

$$\text{FEEPAUM} = 13.66$$

$$\begin{aligned} &-.02 \text{ TOTDAYGR} \\ &+1.83 \text{ DBASIS3} \\ &-1.38 \text{ NHORSES} \\ &+.01 \text{ COWAM} \\ &+.33 \text{ NDRYCAT} \end{aligned}$$

Table 16. Multiple Frame Survey Correlation Analysis

Correlation Coefficient with FEEPAUM

BASIS = Per Acre

	<u>Overall</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>
TOTDAYGR	-.257	-.229	-.277	-.335
NACRES	.058	-.011	.112	.028
NPAIRS	.004	-.064	-.019	.008
TOTHEAD	-.002	-.092	-.010	.005
RECURLSE	-.083	-.175	-.110	.032
FEEDH2O	.004	-.031	.110	.036
MAINTAIN	.204	.235	.281	.098
DOCTOR	.038	.181	.038	-.129
WEEDCTL	.024	.153	-.011	-.120
NLORDSER	.125	.204	.215	.015
OTHLSTK	-.012	.124	-.089	-.033
PUBLAND	.039	-.077	.018	.005
TOTAUGR	.004	-.092	-.017	.006
ACREPHD	.244	.229	.336	.179
TOTALAM	-.067	-.129	.092	-.080

BASIS = Per Pair Per Month or Per Head Per Month

TOTDAYGR	.037	-.071	.038	-.010
NACRES	-.034	-.071	.256	-.046
NPAIRS	.095	.038	.060	.198
TOTHEAD	.149	.061	.085	.249
RECURLSE	-.140	-.231	-.448	-.259
FEEDH2O	-.005	-.169	-.066	.020
MAINTAIN	.069	.054	.143	.013
DOCTOR	.112	.163	-.045	.048
WEEDCTL	.136	.076	-.392	.264
NLORDSER	.115	.041	-.133	.093
OTHLSTK	-.066	.131	-.047	.188
PUBLAND	.016	.049	-.016	.020
TOTAUGR	.153	.056	.093	.270
ACREPHD	-.090	-.189	.115	-.097
TOTALAM	.139	.038	.155	.213

Table 17. Multiple Frame Survey Correlation Analysis

Correlation Coefficient with FEEPAID

BASIS = Per Acre

	<u>Overall</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>
TOTDAYGR	-.082	-.160	-.028	-.213
NACRES	-.223	-.349	-.093	-.342
NPAIRS	-.115	-.214	-.006	-.215
TOTHEAD	-.119	-.247	-.006	-.206
RECURLSE	-.182	-.400	.011	-.078
FEEDH2O	-.091	-.188	-.127	.306
MAINTAIN	.069	.048	.114	.056
DOCTOR	.122	.199	-.021	.080
WEEDCTL	.171	.286	.004	.013
NLORDSER	.064	.082	-.008	.192
OTHLRSTK	-.086	-.150	-.062	-.024
PUBLAND	-.201	-.213	-.145	-.276
TOTAUGR	-.119	-.244	-.010	-.205
ACREPHD	-.414	-.547	-.314	-.504
TOTALAM	-.136	-.239	-.042	-.231

Table 18. Multiple Frame Survey Correlation Analysis

Correlation Coefficient with FEEPAID

BASIS = Per Pair Per Month

BASIS = Per Head Per Month

	<u>Overall</u>	<u>Overall</u>
TOTDAYGR	.065	-.148
NACRES	.045	-.110
NPAIRS	.187	.082
TOTHEAD	.187	-.140
RECURLSE	-.123	-.198
FEEDH2O	.070	.004
MAINTAIN	.092	-.022
DOCTOR	.133	.183
WEEDCTL	.042	.271
NLORDSER	.123	.155
OTHLRSTK	-.056	-.016
PUBLAND	.042	-.109
TOTAUGR	.187	-.130
ACREPHD	-.011	.101
TOTALAM	.167	-.122

Table 19. Multiple Frame Survey Factor Analysis

<u>Factor</u>	<u>Percent of Variance Explained</u>	<u>Factor Loadings</u>
1	19.5	number of cattle grazed
2	13.5	number of acres grazed
3	10.6	number of calves grazed
4	10.0	number of steers grazed
5	9.0	number of heifers grazed
6	7.2	number of landlord services
7	6.5	number of bulls grazed
8	6.2	number of cows grazed
9	4.5	location of grazing - state
10	3.7	basis of fee paid - per acre vs per head per month
11	3.5	total number of days grazed
12	2.3	basis of fee paid - per acre vs per pair per month
13	2.0	number of other livestock
14	1.7	landlord provides maintenance

Table 20. 51-County Study Descriptive Statistics:
Means of Study Variables Not Adjusted for Nonrespondents

Variable	Means				
	Overall	Montana	Nebraska	North Dakota	South Dakota
Sample Size	(2679)	(375)	(382)	(714)	(820)
FEEPAUM	9.75	7.54	11.72	9.53	10.59
NPAIRS	64.83	70.07	53.47	55.42	65.96
NCOMS	6.21	5.62	1.30	4.84	6.28
NEULLS	1.59	2.21	1.11	1.91	1.38
NHEIFER	14.52	12.64	13.63	7.02	13.65
NSTEERS	10.88	2.18	28.52	3.19	8.93
NCAIVES	1.93	.97	2.37	1.85	.31
AUPAIRS	77.79	84.08	64.17	66.50	79.16
AUBULLS	2.06	2.87	1.44	2.48	1.80
AUHEIFERS	10.16	8.85	9.54	4.92	9.56
AUSTEERS	7.62	1.53	19.97	2.23	6.25
AUGALVES	.58	.29	.71	.55	.09
PAIDAYS	107.45	95.05	98.06	112.78	112.78
COMDAYS	13.21	14.06	9.20	14.99	10.92
BULLDAYS	48.06	52.93	46.80	60.80	39.20
HEIFDAYS	32.23	29.44	29.33	29.74	29.52
STERDAYS	13.51	8.19	25.92	6.07	11.25
CALVDAYS	3.89	2.96	5.46	3.25	.99
TOTDAYS	150.14	141.68	158.91	136.18	154.66
NACRES	1954.51	1850.14	1174.50	685.55	2455.41
TOTHEAD	164.77	163.76	153.87	129.63	162.49
NSHEEP	10.32	2.08	0.0	.99	15.56
NHORSES	.46	.27	.28	.23	.65
NDRYCAT	.14	0.0	0.0	.21	.25
NOTHRBFC	20.50	.00	3.53	1.90	57.80
NOTHRAN	.07	0.0	0.0	0.0	.21
TOTALBGG	99.94	93.69	100.40	74.21	96.53
TOTAUGR	104.41	103.24	97.12	81.52	103.14
TOTLSTK	31.48	2.35	3.81	3.33	157.55
ACREPHD	39.29	13.96	54.36	13.29	74.46
PAIRAM	419.80	420.82	390.22	303.81	421.15
COMAN	30.70	25.63	6.99	24.67	31.17
BULLAM	9.62	13.58	7.78	8.17	69.01
HEIFERAM	56.20	48.06	45.56	21.95	7.99
STEERAM	37.54	5.97	99.64	10.41	48.99
CALFAM	3.77	1.48	3.75	1.83	30.53
TOTALAM	557.62	515.56	553.94	370.83	42.63
NLORDSER	1.20	.92	1.59	1.41	982.36
					1.16

Table 21. 51-County Study Size of Cattle Operations

Variable	Means					
	Overall	Montana	Nebraska	North Dakota	South Dakota	Wyoming
Sample Size	(2679)	(375)	(382)	(714)	(820)	(388)
FEEDAUM	9.75	7.54	11.72	9.53	10.59	8.57
TOTHEAD	164.77	163.76	153.87	129.63	162.49	245.94
TOTAUGR	104.41	103.24	97.12	81.52	103.14	157.55
TOTDAYGR	150.14	141.68	158.91	136.18	154.66	165.83
NACRES	1954.51	1850.14	1174.50	685.55	2455.41	4099.88
ACREPHD	39.29	13.96	54.36	13.29	74.89	21.55

Table 22. 51-County Study Descriptive Statistics:
Percent Positive Responses and Mean Fee Paid by State Not Adjusted for Nonrespondents

Variable	Percent Positive Responses					
	Overall	Montana	Nebraska	North Dakota	South Dakota	Wyoming
Sample Size	(2679)	(375)	(382)	(714)	(820)	(388)
RECURLSE	81.6	75.9	92.1	86.3	73.3	85.3
FEEDH2O	50.0	26.5	69.4	73.5	30.4	51.8
MAINTAIN	51.7	46.2	63.1	54.9	48.9	45.7
DOCTOR	6.3	5.3	6.8	2.9	9.6	6.2
WEEDCTL	12.7	14.2	20.2	9.1	11.0	13.9
OTHRSLTK	18.5	6.4	9.7	22.3	22.1	24.2
PUBLAND	42.8	69.6	28.0	24.7	43.1	63.7
Means						
FEEDAUM	9.75	7.54	11.72	9.53	10.59	8.57
NLORUSER	1.20	.92	1.59	1.41	.99	1.16

Table 23. 51-County Study Cross Tabulations
Percent Response (Sample Size - 2679)

Basis	Mean FEEPAUM	State					Wyoming
		Overall	Montana	Nebraska	North Dakota	South Dakota	
Per acre	4.63	44.0	38.4	22.5	63.3	37.2	49.5
Per pair per month	11.92	29.2	32.5	34.3	21.8	34.1	24.0
Per head per month	9.56	25.2	28.3	42.9	12.6	27.2	24.0
Per AUM	9.61	1.6	0.8	0.3	2.2	1.5	2.6
	RECURLSE	FEEDH2O	MAINTAIN	DOCTOR	WEEDCTL	OTHLSTK	PUBLAND
Per acre	50.9	36.6	30.3	7.1	24.3	32.3	45.7
Per pair per month	25.1	33.0	36.6	46.2	38.6	56.0	27.0
Per head per month	22.3	28.9	32.0	46.2	35.3	11.0	25.9
Per AUM	1.7	1.5	1.2	0.6	1.8	0.6	1.4
NLORDSER	Overall	State					RECURLSE
		Montana	Nebraska	North Dakota	South Dakota	Wyoming	
0	31.3	46.2	16.5	15.7	45.7	30.5	33.9
1	30.8	27.6	27.0	37.8	24.9	37.1	31.1
2	26.7	16.2	38.7	38.2	18.3	21.3	26.4
3	8.4	7.6	16.2	6.9	6.5	8.4	7.2
4	2.7	2.4	1.6	1.4	4.6	2.6	1.4

Table 24. 51-County Study Breakdown

Variable - FEPAUM (Means)

Category

	<u>RECURLSE</u>	<u>FEEDH2O</u>	<u>MAINTAIN</u>	<u>DOCTOR</u>	<u>WEEDCTL</u>	<u>OTHRSLSTK</u>	<u>PUBLAND</u>
No	11.40	8.91	8.65	9.64	9.65	9.79	10.37
Montana	9.66	6.99	6.36	7.37	7.32	7.69	7.97
Nebraska	12.67	10.87	10.31	11.63	11.73	11.81	11.62
North Dakota	10.88	8.13	8.91	9.52	9.55	9.71	9.86
South Dakota	12.51	10.02	9.61	10.43	10.47	10.61	11.13
Wyoming	10.13	7.87	7.40	8.49	8.37	8.35	9.29
Yes	9.39	10.60	10.78	11.44	10.39	9.39	8.89
Montana	6.87	9.10	8.88	10.08	8.85	5.26	7.35
Nebraska	11.64	12.09	12.53	12.89	11.65	10.85	11.96
North Dakota	9.31	10.03	10.04	9.76	9.31	8.90	8.41
South Dakota	9.93	11.90	11.62	12.14	11.50	10.18	9.85
Wyoming	8.27	9.27	9.99	10.20	9.59	9.24	8.17
Overall	9.76						

Table 25. 51-County Study Reported Grazing Feb Rates

Variable - FEEPAID

(Mean values with sample size in parentheses)

	State				Overall
	Montana	Nebraska	North Dakota	South Dakota	Wyoming
Per acre	1.76 (144)	4.84 (86)	6.64 (452)	4.48 (305)	2.21 (192)
Per pair per month	10.41 (122)	13.44 (131)	10.01 (156)	13.06 (280)	11.51 (93)
Per head per month	8.81 (106)	10.85 (164)	7.55 (90)	10.41 (223)	8.02 (93)
Per AUM	5.52 (3)	12.00 (1)	9.34 (16)	9.76 (12)	10.86 (10)
					9.61 (42)

Table 26. 51-County Study Analysis of Variance

Variable - FEEPAUM

(Mean values with sample size in parentheses)

	State				Overall
	Montana	Nebraska	North Dakota	South Dakota	Wyoming
Per acre	5.26 (144)	8.81 (86)	9.61 (452)	8.27 (305)	6.69 (192)
Per pair per month	8.68 (122)	11.20 (131)	8.34 (156)	10.89 (280)	9.59 (93)
Per head per month	9.37 (106)	13.65 (164)	11.19 (90)	13.45 (223)	11.18 (93)
Per AUM	5.52 (3)	12.00 (1)	9.34 (16)	9.76 (12)	10.86 (10)
Overall	7.53 (375)	11.72 (382)	9.53 (714)	10.59 (820)	8.57 (388)
					9.75 (2679)

Table 27. 51 County Study Duncan's Multiple Range Test

Analysis of Variance - FEEPAUM by BASIS

Level of Significance - 5%

Means Not Significantly Different for Variable - BASIS

		<u>Code</u>	<u>Description</u>				
		1	Per acre				
		2	Per pair per month				
		3	Per head per month				
		4	Per AUM				
<u>Overall</u>	<u>Montana</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>	<u>Wyoming</u>		
(1,4)	(1,4)	(1,2,4)	(1,3,4)	(1,4)	(2,4)		
(2,4)	(2,4)	(3,4)	(2,4)	(2,4)	(3,4)		
	(2,3)						

Table 28. 51-County Study Correlation Analysis

Correlation Coefficient with FEPAUM

	Overall	Montana	Nebraska	North Dakota	South Dakota	Wyoming
TOTDAYGR	-.173	-.163	-.278	-.153	-.156	-.300
NACRES	-.007	-.007	.069	-.010	.005	-.012
NPAIRS	-.073	-.081	-.070	-.076	-.037	-.058
TOTHEAD	-.069	-.095	-.005	-.129	-.036	-.049
RECURLSE	-.151	-.357	-.060	-.107	-.230	-.111
FEEDH2O	.174	.290	.121	.167	.173	.134
MAINTAIN	.220	.373	.231	.111	.206	.281
DOCTOR	.079	.182	.068	.008	.092	.048
WEEDCTL	.047	.162	-.007	-.013	.054	.092
NLORDSER	.220	.385	.182	.145	.200	.241
OTHLRLSTK	-.030	-.178	-.061	-.061	-.039	.094
PUBLAND	-.159	-.100	.033	-.121	-.152	-.118
TOTAUGR	-.072	-.104	-.005	-.141	-.032	-.050
ACREPHD	.005	.100	-.031	-.049	.000	.036
TOTALAM	-.102	-.118	-.107	-.133	-.079	-.124

Table 29. 51 County Study Multiple Regression

(Overall Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
PAIRDAYS	-.143
COWDAYS	-.115
TOTDAYGR	-.173
RECURLSE	-.151
FEEDH2O	.174
MAINTAIN	.220
PUBLAND	-.159
NLORDSER	.220
PAIRAM	-.113
TOTALAM	-.102
DSTATE1	.171
DSTATE3	.107
DSTATE4	-.103
DBASIS1	-.278
DBASIS3	.295

Stepwise Regression Equation

$$R^2 = .2161$$

$$\begin{aligned} \text{FEEPAUM} = & 10.06 \\ & +2.46 \text{ DBASIS3} \\ & +1.11 \text{ MAINTAIN} \\ & - .01 \text{ TOTDAYGR} \\ & -1.12 \text{ PUBLAND} \\ & +1.89 \text{ DSTATE3} \\ & +2.10 \text{ DSTATE1} \\ & +1.10 \text{ FEEDH2O} \\ & -1.03 \text{ RECURLSE} \\ & -.005 \text{ COWDAYS} \end{aligned}$$

Table 30. 51 County Study Multiple Regression

(Montana Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
PAIRDAYS	-.191
BULLDAYS	-.160
TOTDAYGR	-.163
RECURLSE	-.357
FEEDH2O	.290
MAINTAIN	.373
DOCTOR	.182
WEEDCTL	.162
OTHLSTK	-.178
NLORDSER	.385
DBASIS1	-.527
DBASIS2	.235
DBASIS3	.339

Stepwise Regression Equation

$$R^2 = .3358$$

$$\begin{aligned} \text{FEPAUM} = & 8.71 \\ & -2.36 \text{ DBASIS1} \\ & + .53 \text{ NLORDSER} \\ & -1.28 \text{ RECURLSE} \\ & + .76 \text{ DBASIS3} \end{aligned}$$

Table 31. 51 County Study Multiple Regression

(Nebraska Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
NCOWS	-.154
PAIRDAVS	-.208
COWDAVS	-.147
BULLDAVS	-.119
TOTDAYGR	-.278
FEEDH2O	.121
MAINTAIN	.231
NLORDSER	.182
PAIRAM	-.144
COWAM	-.118
DBASIS1	-.336
DBASIS3	.361

Stepwise Regression Equation

$$R^2 = .2281$$

$$\begin{aligned} \text{FEEPAUM} = & 13.04 \\ & +2.33 \text{ DBASIS3} \\ & - .02 \text{ TOTDAYGR} \\ & +1.24 \text{ MAINTAIN} \\ & - .06 \text{ NCOWS} \\ & -1.27 \text{ DBASIS1} \end{aligned}$$

Table 32. 51 County Study Multiple Regression

(North Dakota Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
NCOWS	-.148
NCALVES	-.126
COWDAYS	-.137
TOTDAYGR	-.153
TOTHEAD	-.129
RECURLSE	-.107
FEEDH20	.167
MAINTAIN	.111
PUBLAND	-.121
TOTALBCG	-.155
NLORDSER	.145
TOTAUGR	-.141
PAIRAM	-.099
CALFAM	-.110
TOTALAM	-.133
DBASIS2	-.117
DBASIS3	.119

Stepwise Regression Equation

$$R^2 = .1362$$

$$\text{FEEPAUM} = 12.26$$

+1.46	FEEDH20
- .01	TOTDAYGR
- .01	TOTALBCG
-2.37	DBASIS2
-1.73	RECURLSE
+1.21	MAINTAIN
- .02	NCOWS
- .03	NCALVES
- .88	PUBLAND

Table 33. 51 County Study Multiple Regression

(South Dakota Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
PAIRDAYS	-.135
TOTDAYGR	-.156
RECURLSE	-.230
FEEDH2O	.173
MAINTAIN	.206
DOCTOR	.092
PUBLAND	-.152
NLORDSER	.200
DBASIS1	-.375
DBASIS3	.368

Stepwise Regression Equation

$$R^2 = .2284$$

$$\begin{aligned} \text{FEEPAUM} = & 12.43 \\ & -1.63 \text{ DBASIS1} \\ & +2.64 \text{ DBASIS3} \\ & -1.28 \text{ RECURLSE} \\ & - .91 \text{ PUBLAND} \\ & - .01 \text{ TOTDAYGR} \\ & + .82 \text{ MAINTAIN} \end{aligned}$$

Table 34. 51 County Study Multiple Regression

(Wyoming Regression)

Significant Correlations

<u>Variable</u>	<u>Correlation</u>
NBULLS	-.119
PAIRDAYS	-.249
COWDAYS	-.114
BULLDAYS	-.167
TOTDAYGR	-.300
RECURLSE	-.111
FEEDH2O	.134
MAINTAIN	.281
NDRYCAT	-.111
PUBLAND	-.118
NLORDSER	.241
PAIRAM	-.144
BULLAM	-.104
TOTALAM	-.124
DBASIS1	-.376
DBASIS2	.119
DBASIS3	.286

Stepwise Regression Equation

$$R^2 = .2154$$

$$\text{FEEPAUM} = 11.34$$

$$\begin{aligned}
 &-2.52 \text{ DBASIS1} \\
 &- .01 \text{ TOTDAYGR} \\
 &+1.66 \text{ MAINTAIN} \\
 &- .94 \text{ PUBLAND}
 \end{aligned}$$

Table 35. 51-County Study Correlation Analysis

Correlation Coefficient with FEEPAUM

Basis = Per Acre

	<u>Overall</u>	<u>Montana</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>	<u>Wyoming</u>
TOTDAYGR	-.247	-.042	-.382	-.231	-.176	-.280
NACRES	-.027	.087	.166	.072	.048	.020
NPAIRS	-.118	.091	-.060	-.103	-.121	-.111
TOTHEAD	-.124	.059	-.035	-.177	-.108	-.066
RECURLSE	-.093	.010	.137	-.086	-.202	-.017
FEEDH2O	.206	-.063	.097	.184	.057	.129
MAINTAIN	.204	.273	.041	.142	.183	.214
DOCTOR	.013	.213	-.127	-.008	.032	--
WEEDCTL	.019	.096	-.186	-.013	.012	.205
NLORDSER	.233	.209	-.013	.177	.146	.261
OTHLRLSTK	.000	-.069	-.002	.050	-.043	.155
PUBLAND	-.207	-.221	-.074	-.150	-.110	-.020
TOTAUGR	-.126	.051	-.034	-.192	-.098	-.063
ACREPHD	.089	.213	.372	.335	.258	.239
TOTALAM	-.135	.024	-.142	-.177	-.129	-.112

Basis = Per Pair Per Month or Per Head Per Month

TOTDAYGR	.046	-.096	-.040	.100	.012	-.027
NACRES	-.018	.080	.115	-.076	-.046	-.080
NPAIRS	.029	-.066	.059	.004	.090	.056
TOTHEAD	.055	-.023	.146	.002	.090	.035
RECURLSE	-.084	-.272	-.100	-.224	-.098	-.038
FEEDH2O	.070	.251	.062	.112	.040	.002
MAINTAIN	.093	.124	.197	.058	.048	.158
DOCTOR	.044	.130	.079	.041	.001	-.085
WEEDCTL	-.005	.053	-.008	-.029	-.004	-.082
NLORDSER	.082	.212	.139	.084	.035	.018
OTHLRLSTK	-.132	-.055	-.086	-.241	-.095	-.028
PUBLAND	-.102	.059	.126	-.037	-.118	-.249
TOTAUGR	.055	-.018	.140	-.005	.093	.027
ACREPHD	-.016	-.040	-.102	-.117	-.031	-.102
TOTALAM	.054	-.035	.118	.015	.075	.026

Table 36. 51-County Study Correlation Analysis

Correlation Coefficient with FEEPAID

Basis = Per Acre

	<u>Overall</u>	<u>Montana</u>	<u>Nebraska</u>	<u>North Dakota</u>	<u>South Dakota</u>	<u>Wyoming</u>
TOTDAYGR	-.107	.114	-.063	-.006	.016	.070
NACRES	-.153	.063	-.007	-.117	-.089	-.065
NPAIRS	-.070	.127	.050	.015	.044	.062
TOTHEAD	-.101	.095	-.035	-.032	.062	.020
RECURLSE	-.117	-.092	.048	-.035	-.291	-.014
FEEDH2O	.351	-.023	-.029	.260	.150	.195
MAINTAIN	.235	.352	-.082	.117	.246	.226
DOCTOR	.071	.223	-.108	.084	.026	--
WEEDCTL	-.013	.088	-.090	-.024	.045	.155
NLORDSER	.328	.275	-.114	.214	.232	.286
OTHLRSTK	-.111	-.049	-.033	-.054	-.085	.026
PUBLAND	-.433	-.195	-.285	-.356	-.204	-.280
TOTAUGR	-.105	.088	-.030	-.040	.068	.013
ACREPHD	-.341	-.213	-.153	-.225	-.305	-.207
TOTALAM	-.107	.116	-.038	-.052	.032	-.012

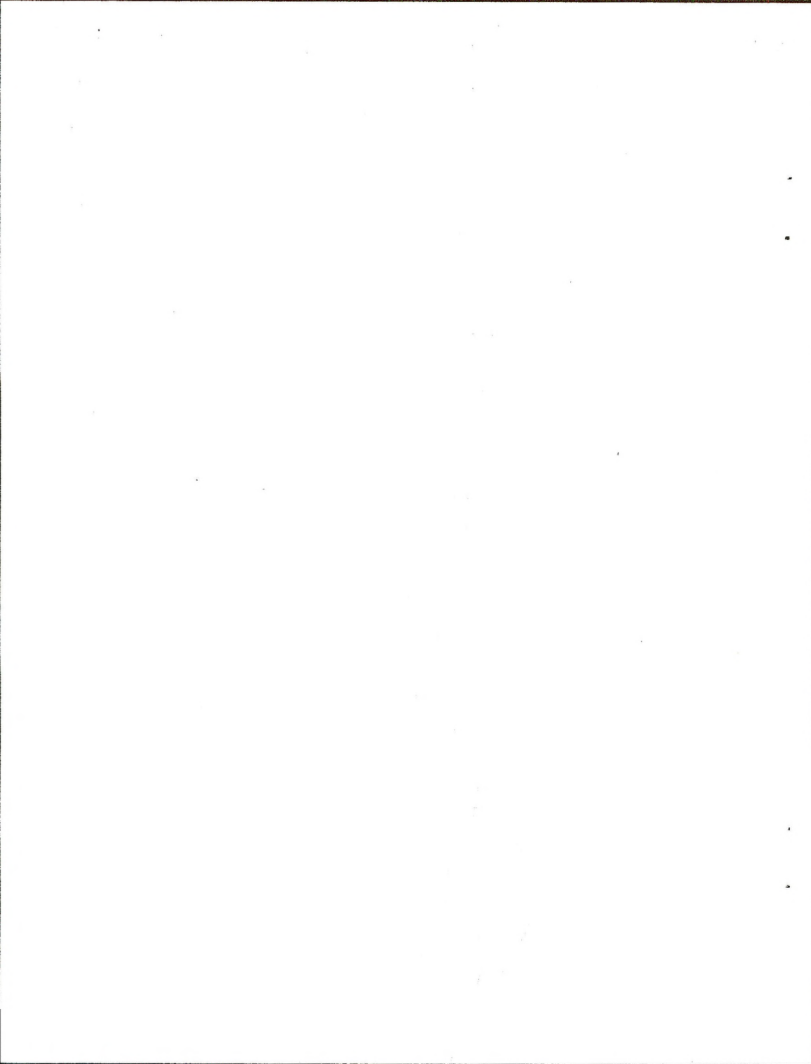
Table 37. 51 County Correlation Study

Correlation Coefficient with FEEPAID

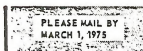
Basis =	Per pair per month	Per head per month
	<u>Overall</u>	<u>Overall</u>
TOTDAYGR	.060	-.059
NACRE	.001	-.053
NPAIRS	.026	.060
TOTHEAD	.026	.088
RECURLSE	-.183	-.096
FEEDH20	.109	.024
MAINTAIN	.144	.085
DOCTOR	.146	-.028
WEEDCTL	.034	.020
NLORDSER	.164	.046
OTHLRSTK	-.079	.007
PUBLAND	-.065	-.110
TOTAUGR	.026	-.087
ACREPHD	.009	.022
TOTALAM	.031	-.089

Table 38. 51 County Study Factor Analysis

<u>Factor</u>	<u>Percent of Variance Explained</u>	<u>Factor Loadings</u>
1	25.9	Number of cattle grazed
2	11.7	Number of other livestock
3	10.2	Number of steers grazed
4	8.8	Number of calves grazed
5	7.4	Number of heifers grazed
6	7.1	Number of cows grazed
7	5.9	Number of bulls grazed
8	4.6	Number of landlord services
9	4.1	Basis of fee paid - per acre vs per head per month
10	4.0	Total number of days grazed
11	2.8	Basis of fee paid - per acre vs per pair per month
12	2.4	Landlord provides feed and water
13	2.0	Landlord provides maintenance
14	1.8	Presence of other livestock
15	1.4	Grazing on public land



March 1975 Farm Report Questionnaire



FARM REPORT
U.S. DEPARTMENT OF AGRICULTURE
Statistical Reporting Service



Please make corrections in name, address, and ZIP Code, if necessary.

It's about that time...

when the busy Spring season keeps us jumping. Your report will help us give you up-to-date information which will in turn help you in planning and marketing your crops.

This service is possible only with your valuable help, so thanks a lot.

Please remember to:

1. Note the instructions.

2. Mail your report promptly in the enclosed envelope which needs no stamp.

Respectfully,

Bruce M. Graham

Bruce M. Graham
Chairman, Crop Reporting Board

P. S. Individual reports are kept confidential.

"Farm With Facts"

INSTRUCTIONS

e Enter dash (-) for the questions that do not apply to your locality. On questions relating to your operations, enter 0 when zero or none is the answer.

e In reporting grain and hay sold and to be sold, include quantities of the 1974 crop only. Report sales to date plus expected future sales from the 1974 crop. Include the landlord's share on sales if it is moved off this place. Also, include 1974 grains placed under loan or purchase agreement as sales except quantities you expect to redeem and feed.

e In reporting cash rents for your locality omit all lands whose rental rate is affected by use or offer for town or suburban lots, resort, "country home", timber, mining, oil, factory or other purposes primarily nonagricultural.

e In reporting values for your locality, omit all lands where value is affected by use or offer for town or suburban lots, resort, "country home", timber, mining, oil, factory, or other uses primarily nonagricultural.

Reported by _____

County _____ Date _____

C.E. 02-0342

New Mexico, Arizona, Nevada

Please Answer These Questions For
All Land You Operate

Answer
here
↓

FIELD CROPS

CORN for grain produced on this farm or ranch last year (1974 crop) - TONS	011
CORN for grain of 1974 crop sold and to be sold - TONS	012
BARLEY produced on this farm or ranch last year (1974 crop) - TONS	101
BARLEY of 1974 crop sold and to be sold - TONS	102
SORGHUM GRAIN produced on this farm or ranch last year (1974 crop) - TONS	151
SORGHUM GRAIN of 1974 crop sold and to be sold - TONS	152
HAY of all kinds harvested on this farm or ranch last year (1974 crop) - TONS	201
HAY of 1974 crop sold and to be sold - TONS	202

Please Answer These Questions
For Your Locality

CASH RENTS

Report average cash rents expected in your locality during the 1975 season

ALL IRRIGATED LANDS	750
Average rent per acre for farms rented entirely for cash	\$
Value per acre of these cash - rented farms	\$
ALL DRY-FARMING LANDS	760
Average rent per acre for farms rented entirely for cash	\$
Value per acre of these cash - rented farms	\$
ALL NONIRRIGATED GRAZING or PASTURE LANDS	762
Average rent per acre for pasture or grazing land	\$
Value per acre of this pasture or grazing land	\$
Average rate for pasturing cattle on PRIVATELY OWNED LAND this year per head per month	\$

FARM (RANCH) LAND VALUES

ALL IRRIGATED FARM LANDS with improvements	712
Average value per acre NOW	\$
Average value per acre A YEAR AGO	\$
ALL DRY FARM LANDS with improvements	714
Average value per acre NOW	\$
Average value per acre A YEAR AGO	\$
ALL NONIRRIGATED GRAZING or PASTURE LANDS with improvements	716
Average value per acre NOW	\$
Average value per acre A YEAR AGO	\$

Over, please

Reproduced from
best available copy.

C.E. 02-0342
N. Mex., Ariz., Nev.
March 1975

31 OMB No. 49-00007
Approval expires 12-31-75

If you operate land that is separated
from your main headquarters, count
ONLY the farms (ranches) and changes
around the headquarters unit.

PLEASE COMMENT ON CROP AND LIVESTOCK
CONDITIONS AND ON FARM ACTIVITIES:

Please Answer These Questions
For Your Locality

Answer
here
↓

FARM (RANCH) OWNERSHIP	
NUMBER OF FARMS OR RANCHES: Count the farms or ranches that border yours, are across roads, or corner on yours; then add 1 more for your farm or ranch - (Include only those properties used principally for farming) - TOTAL NUMBER	775
In the above group of farms or ranches, how many CHANGES in OWNERSHIP occurred during the past 12 months? (If the same property changed ownership more than once, count each transfer separately. If none, report "0") - NUMBER CHANGES	776
If there were CHANGES in OWNERSHIP, please show below the number made as a result of: VOLUNTARY sales or trade ("bona fide" sales, "straight" sales, etc. Include contracts to purchase but not options) - NUMBER	777
ESTATE settlements (by sale) - NUMBER	778
INHERITANCE and GIFTS (Transfers without purchase) - NUMBER	779
FORECLOSURE of MORTGAGES or BANKRUPTCY. (Include assignment to creditor and other transfers to avoid foreclosure.) - NUMBER	780
ALL OTHER changes in ownership not classified above. (DO NOT count changes in tenants.) - NUMBER	781
ACREAGES IN FARM (RANCH) TRANSFERS	
For the change(s) in ownership reported above, list the ACRES involved in each transfer:	782
ACRES	783
ACRES	784
ACRES	

Over, please

1977 December Livestock Survey Questionnaire

SECTION I - CHARGES FOR GRAZING CATTLE

Operator lives ☐ INSIDE - Continue ☐ OUTSIDE - Go to Section J.

Reproduced from
best available copy.

1. Did you rent out any non-irrigated grazing land during 1977?

☐ NO ☐ YES - 1a. What was this charge?

Dollars and Cents

Per AUM

911

or

Per Acre

913

Cattle reported in Section G or code 1 in 493 code box.

☐ YES ☐ NO - Go to Section J

2. What was the average charge paid in this area to graze cattle on privately owned, non-irrigated grazing land during 1977?

Per AUM

915

Per Cow with Nursing Calf
Per Month

917

Per Yearling
Per Month

919

3. Did you pay rent or a fee to graze cattle on privately owned, non-irrigated grazing land during 1977?

☐ YES ☐ NO - Go to Section J.

4. Was this charge on an AUM basis?

☐ NO ☐ YES - 4a. What was the average charge you paid?... Per AUM

921

4b. What was the total dollars paid?.....

922

Go to Section J

5. What were the on and off dates and number of cattle you had on this grazing land?

Kind of Cattle	Number Head	On Date	Off Date	Office Use
(a) Cows with nursing calves	925			926
(b) Yearlings & Calves over 500 lbs	927			928
(c) Calves under 500 lbs	929			930
(d) Bulls	931			932

(Second rental arrangement)

(a) Cows with nursing calves	933			934
(b) Yearling & Calves over 500 lbs	935			936
(c) Calves under 500 lbs	937			938
(d) Bulls	939			940

- 5a. What was the total dollars paid for use of this grazing land?.....

941

1978 Wyoming Grazing Fee Survey



Form Approved
O.M.B. Number 40-R3774
Approval Expires 3-31-81

WYOMING GRAZING FEE SURVEY

10 30 0054129 05

COOK, PAUL R.
RT. 2, BOX 10
CHEYENNE, WYOMING 82001

Please make corrections in name, address, and Zip Code, if necessary.

INTRODUCTION

Mr. Cook, I am John Jones from the Wyoming Crop and Livestock Reporting Service. We are conducting a special survey of cattlemen in Wyoming to evaluate the current level of grazing rates on privately owned, non-irrigated grazing land during 1978. Response to this survey is voluntary and not required by law. However, your cooperation is very important to insure timely and accurate information. Your report is confidential and used only in combination with reports from other cattlemen in evaluating results of this survey.

1. In January, it was determined that you paid a fee for, or rented privately owned, non-irrigated grazing land from someone else during 1978.

Is that correct?

☒ YES - Go to page 2.

☐ NO - Explain _____

(Conclude Interview)

Reproduced from
best available copy.

CHARGES FOR GRAZING CATTLE

I would like to ask some questions concerning the land you rented or leased.

2. Did you have more than one rental arrangement during 1978?

☒ YES - Complete a separate column for each arrangement.
☐ NO - Complete first column only.

3. What was the basis for the fee or rent of (this or each) arrangement?

AUM = 1
 Per Acre = 2
 Rate of Gain = 3

} Enter Code

First Arrangement	Second Arrangement	Third Arrangement
932 2	949 1	969

4. What were the starting and ending dates of grazing and number of head you had for (this or each) arrangement?

Number Head	930	950	970
—	—	—	—

On Date _____

COWS WITHOUT CALVES
 (During grazing period)

Off Date _____

Office Use	931	951	971
—	—	—	—

Number Cows	932	952	972
150	200	—	—

On Date MAY 1, 1978 JUNE 1 '78

Off Date	933	953	973
OCT. 1, 1978	OCT 31 '78	—	—

Office Use	933	953	973
—	—	—	—

Number Head	934	954	974
—	—	—	—

On Date _____

Off Date _____

Office Use	935	955	975
—	—	—	—

Number Head	936	956	976
—	—	—	—

On Date _____

Off Date _____

Office Use	937	957	977
—	—	—	—

Number Head	938	958	978
—	10	—	—

On Date JUNE 1 '78

Off Date OCT 31 '78

Office Use	939	959	979
—	—	—	—

BULLS



CHARGES FOR GRAZING CATTLE (Cont'd)

	First Arrangement	Second Arrangement	Third Arrangement
Number Ewes	940 —	980 —	980
On Date			
Off Date	941	961	981
Office Use			
5. What were the total dollars paid during 1978 for grazing on this land? <i>11.25/Acre</i> Dollars	942 1500	962 3500	982
6. How many acres were grazed? Acres	943 1200	963 1250	983
7. Were these lease arrangements for more than one grazing season?	944 3	964 —	984
☒ YES - How many years? Years			
☐ NO - Continue.			
8a. Did cattle receive any hay, silage or supplemental feed while grazing on this land?	945 1	965 2	985
☒ YES = 1 } Enter Code			
☐ NO = 2 (Enter code, go to Item 9)			
8b. Who provided the feed and labor for this feeding?	946 1	966	986
☒ Owner of Cattle = 1 } Enter Code			
☐ Land Owner = 2			
9. What percent of material and labor for maintenance of fencing and watering facilities was provided by the land owner? Percent	947 —	967 100	987
10. What percent of material and labor for salting, checking on water and regular observation of cattle for veterinary control was provided by the land owner? Percent	948 —	968 —	988
11. What percent of the labor for livestock control and herding (moving cattle from pasture to pasture) was provided by the land owner? Percent	949 —	969 —	989

 Reproduced from
 best available copy.


1981 Five-State Private Grazing Fee Survey Questionnaire
(Northern Great Plains Study)

	FIRST ARRANGEMENT	SECOND ARRANGEMENT	THIRD ARRANGEMENT
3. Can I refer to these arrangements by a name or number to avoid confusion? (Specify name)			
4. What was the fee you paid to graze beef cattle on this arrangement?	120	180	250
	101	181	261
BASIS CODE			

1 = PER ACRE

3 = PER HEAD PER MONTH

2 = PER PAIR, PER MONTH
(Per Cow with Nursing Calf)

4 = PER AUM (1 Cow)

Other (Specify) _____

5. Now I would like to ask the number of beef cattle and dates of grazing by class for this arrangement.

PAIRS (cows and heifers with with nursing calves)	NUMBER	102	182	252
	ON DATE			
	OFF DATE			
	OFFICE USE	154	184	254
COWS without nursing calves (excluding dairy cows)	NUMBER	106	186	256
	ON DATE			
	OFF DATE			
	OFFICE USE	108	188	258
BULLS	NUMBER	110	190	270
	ON DATE			
	OFF DATE			
	OFFICE USE	112	192	272
HEIFERS weighing 500 lbs. or more (excluding dairy heifers and heifers still nursing)	NUMBER	114	194	274
	ON DATE			
	OFF DATE			
	OFFICE USE	116	196	276
STEERS weighing 500 lbs. or more (excluding steers still nursing)	NUMBER	118	198	278
	ON DATE			
	OFF DATE			
	OFFICE USE	120	200	280
WEANED CALVES weighing less than 500 lb.	NUMBER	122	202	282
	ON DATE			
	OFF DATE			
	OFFICE USE	124	204	284
	OFFICE USE	128	206	286

Reproduced from
best available copy.



	FIRST ARRANGEMENT	SECOND ARRANGEMENT	THIRD ARRANGEMENT
6. How many ACRES were grazed in this arrangement?	128	208	214

7. What is the COUNTY and STATE location of this arrangement?

Enumerator Note: If an arrangement involves land in more than one county, list all counties involved.

COUNTY

STATE

OFFICE USE	130	210	290
	131	211	291

8. Is this lease arrangement a usual, recurring and essential part of your operation?

ENTER CODE: YES = 1, NO = 2

132	212	292
-----	-----	-----

9. Did the landlord provide any of the following materials or services under this arrangement?

Feed, water, salt or minerals?	133	213	293
Fence, well or pond maintenance?	134	214	294
Doctoring or feeding?	135	215	295
Weed control?	136	216	296

10. Did you have other domestic livestock grazing this land with your beef cattle?

137	217	297
-----	-----	-----

Enumerator Note: If the answer to Question 10 is "YES", ask Question 11.
If the answer to Question 10 is "NO", go to Question 12.

11. What number of head and species of domestic livestock grazed with the beef cattle?

Species	Number		
Sheep	138	218	298
Horses	139	219	299
Dairy Cattle	140	220	300
Other Beef Cattle (landlord's, neighbor's, etc. not previously reported)	141	221	301
Other (Specify)	142	222	302

12. During 1981 did you rent or pay a fee for the use of any Federal, State or Indian Tribal land for grazing cattle?

YES = 1 NO = 2

ENTER CODE

143

That completes the survey. Thank you for your help.

Reported by _____ Enumerator _____ Date _____



1982 June Enumerative Survey Questionnaire
and Interviewer's Manual

SECTION I — CHARGES FOR GRAZING CATTLE

Refer to face page to check box.

Operator lives: ☐ INSIDE - Continue. ☐ OUTSIDE - Go to Section J.

Cattle reported in Section F, page 10?

☐ YES - Continue. ☐ NO - Go to Section J.

Now I would like information on the average charge for grazing cattle on privately owned, non-irrigated grazing land.

1. What is the average charge paid in this area to graze cattle on privately owned, non-irrigated grazing land?

Per AUM (1 cow)	915		
	Dollars	Cents	

- OR -

Per Cow With Nursing Calf Per Month	917		
	Dollars	Cents	

2. During 1982 have you paid a fee for grazing cattle on privately owned, non-irrigated land? Exclude Federal, State or Indian Tribal land, and grazing land where cropland and/or land with buildings were part of the fee.

☐ YES = 1 } Enter Code and go
☐ NO = 2 } to Section J

913

CHAPTER 5
PART A QUESTIONNAIRE
CHARGES FOR
GRAZING CATTLE

Information on this page may not
be applicable to your State. Refer
to list of effective pages to make
determination.

Purpose of Section I is to determine charges for grazing cattle on privately owned, non-irrigated grazing land. Data obtained from resident farm operators, with cattle, will be used to compute the "Forage Value Index", a component of the grazing fee formula prescribed in Public Rangelands Improvement Act of 1978. The formula establishes annual fees for grazing cattle on certain Federal land administered by Forest Service and Bureau of Land Management.

SECTION I - CHARGES FOR GRAZING CATTLE

Refer to face page to check box.

Operator lives: ☒ INSIDE - Continue. ☐ OUTSIDE - Go to Section J.

Cattle reported in Section F, page 10?

☒ YES - Continue. ☐ NO - Go to Section J.

Now I would like information on the average charge for grazing cattle on privately owned, non-irrigated grazing land.

1. What is the average charge paid in this area to graze cattle on privately owned, non-irrigated grazing land?

Per AUM (1 cow)
Dollars Cents

- OR -

Per Cow With Nursing
Calf Per Month
Dollars Cents

- OR -

Per Head Per Month
Dollars Cents

Refer to Cattle and Calves on Entire Farm, page 10, to determine if cattle were reported. If cattle were reported ask Item 1; otherwise, go to Section J.

Item 1: Average Charge for Grazing Cattle

This question determines, to the best of the respondent's knowledge, the average charge for grazing cattle on privately owned, non-irrigated land in his/her area. The respondent does not have to be using grazing land to answer, but simply know the "typical" or prevailing charge.

Charges can vary substantially from area to area depending on the division of responsibilities over who will maintain the fences, water facilities, put out salt and observe the cattle, etc. Charges can also vary depending on other variables such as types of pasture, renting from relatives and other factors. For this survey both "high" and "low" fees are to be included.



Information on this page may not
be applicable to your State. Refer
to list of effective pages to make
determination.

CHAPTER 5
PART A QUESTIONNAIRE
CHARGES FOR
GRAZING CATTLE

Item 1 asks average charges per AUM (1 cow), per cow with nursing calf or per head per month depending on your State's version of the questionnaire. Many times there is no charge for the nursing calf so ranchers will report these units as a rate per AUM. When an AUM rate is reported, but it consists of a cow with nursing calf, the rate must be recorded in code box 917.

The respondent need only answer one classification. Do not probe for answers to this question because no entry is necessary. Enter a dash (—) or DON'T KNOW. Be sure to show any calculations on the questionnaire you use to arrive at the correct answer.

2. During 1982 have you paid a fee for grazing cattle on privately owned, non-irrigated land?
Exclude Federal, State or Indian Tribal land, and grazing land where cropland and/or land with buildings were part of the fee.

☒ YES = 1
☐ NO = 2

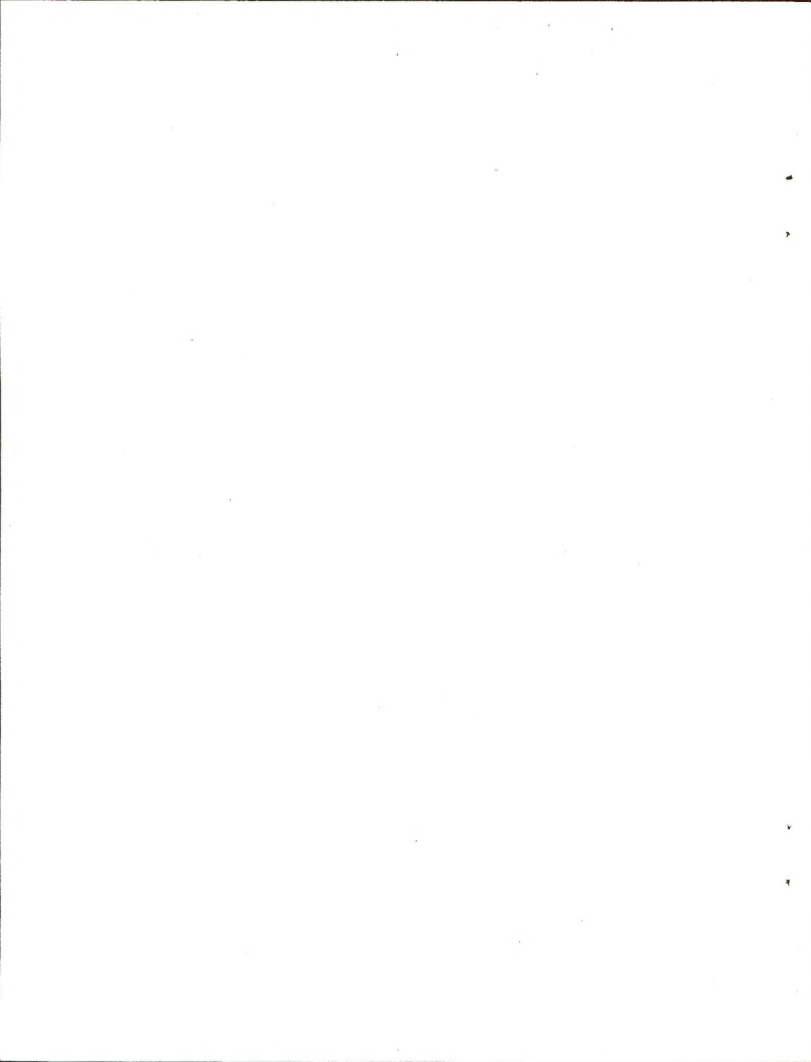
Enter Code and go
to Section J

913 /

Item 2: Have you paid a fee for grazing beef cattle?

This question is asked so that we can get a count of the respondents who have actually paid a fee for grazing cattle on PRIVATELY OWNED, non-irrigated land during 1982. If yes is answered, put a 1 in code box 913. If no is answered place a 2 in the code box.





Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

